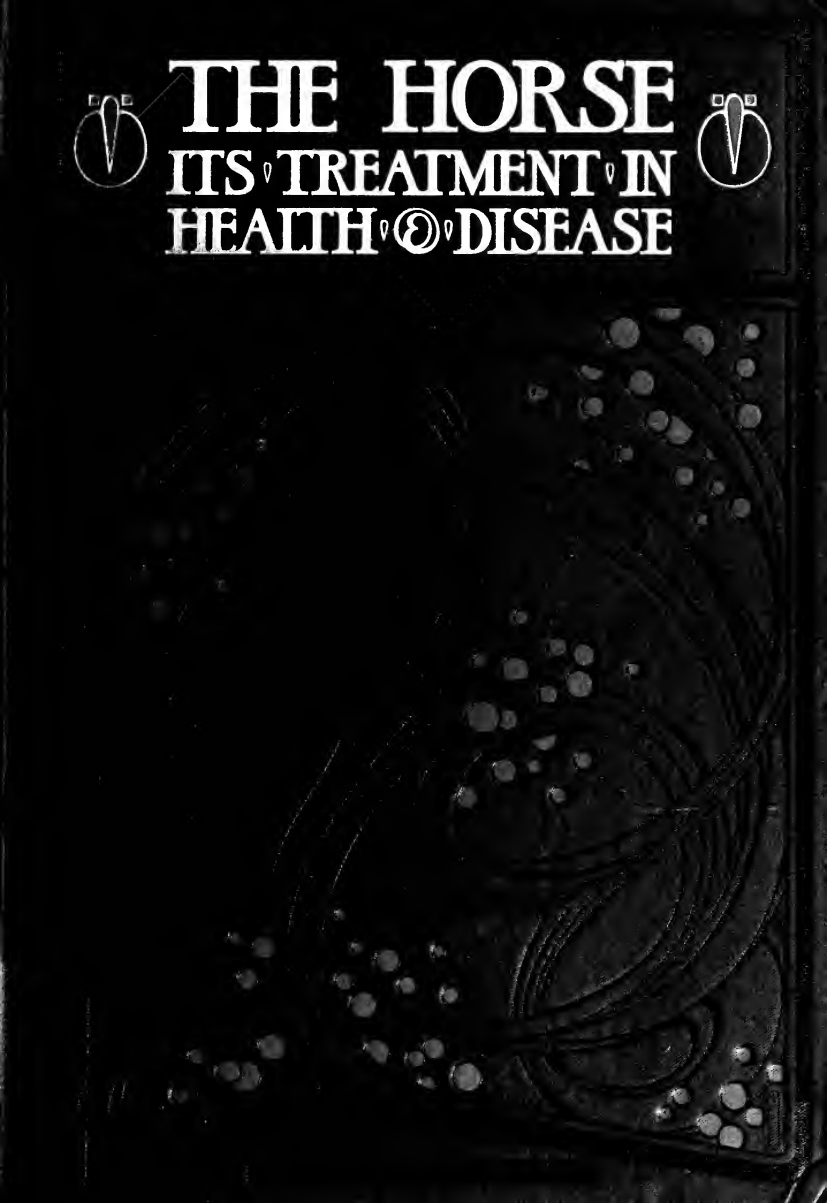
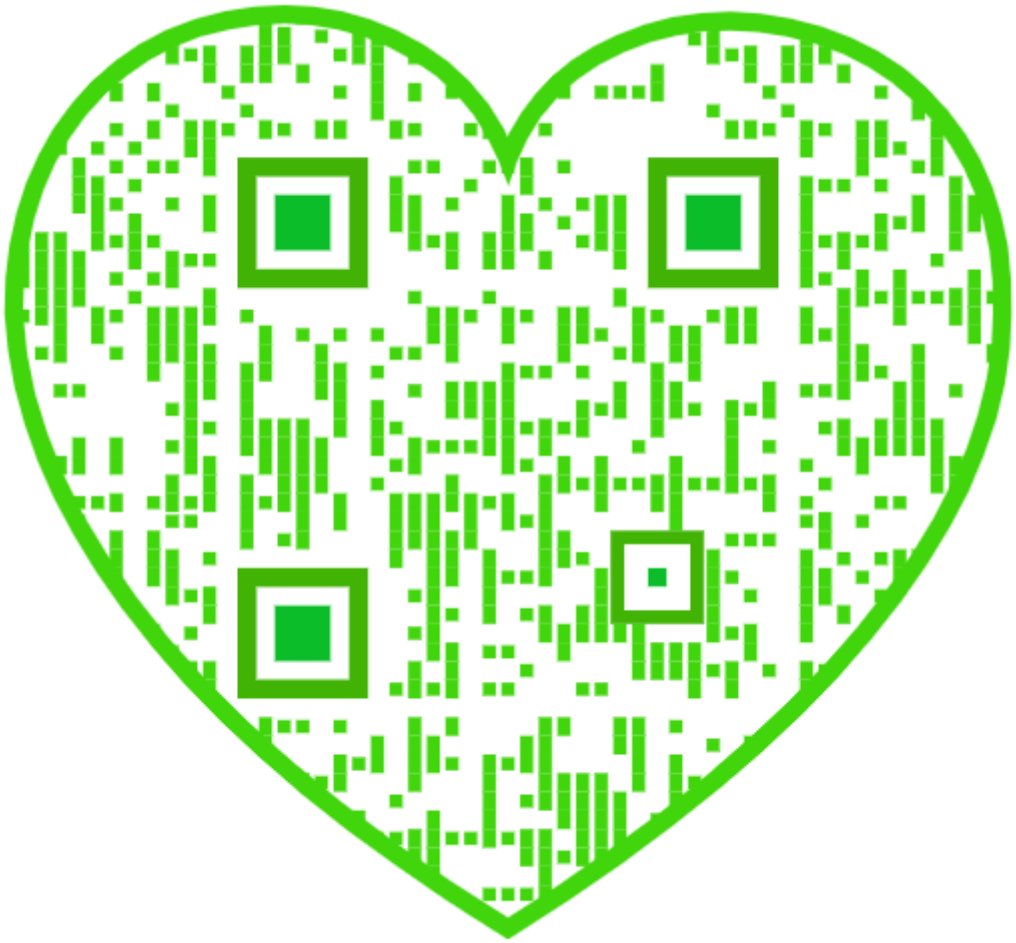
THE HORSE
ITS TREATMENT IN HEALTH & DISEASE





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THE HORSE

ITS TREATMENT IN HEALTH AND DISEASE

BERJEAU

ITS TREATMENT IN HEALTH AND DISEASE

WITH A COMPLETE GUIDE TO BREEDING
TRAINING AND MANAGEMENT

Edited by

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"Examination of Horses as to Soundness" "Glanders, its Spread and Suppression" "Swine Fever"
"Lithotomy or the Removal of Stone from the Bladder of the Horse"

DIVISIONAL VOLUME IV

LONDON

34 SOUTHAMPTON STREET, STRAND

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SECTION IV.—HEALTH AND DISEASE—*Continued*

7. THE ORGANS OF RESPIRATION—*Continued*

DISEASES OF THE LUNGS

General Considerations.—Under this general term are included the disorders affecting the bronchial tubes, the lung tissue itself, and its investing membrane—the pleura. Although the diseases are considered separately and receive special names, they are frequently found to exist together. Nevertheless, it is common to find one particular structure so prominently affected as to warrant the use of a name identifying the disease. A compromise in nomenclature, where two principal structures are at the same time affected, may be found in such terms as broncho-pneumonia, pleuro-pneumonia, &c., at one time in exclusive use by the professions, but now generally understood by the public, who are familiarized in great part with medical terms through reading in the lay press accounts of the illnesses of eminent persons.

BRONCHITIS

Definition.—Bronchitis is an inflamed condition of the mucous membrane lining the bronchial tubes.

It may occur as a primary disorder in which the larger bronchi are chiefly involved, or it may follow upon or complicate other diseases. Two forms of the malady are recognized—one sharp and of brief duration, known as acute bronchitis, and the other less severe but protracted, termed chronic.

Causes.—The predisposing causes are weakness, old age, and damp, cold stables. A previous attack and the exhausting influence of other diseases also increase the liability to a second seizure. Young horses in close stables are more subject to it than others, if we except the worn-out

and exhausted. The disease may also be excited by the accidental introduction of medicinal agents into the air-passages while administering draughts, exposure to easterly or north-easterly winds after exertion or fatigue, or it may complicate an attack of influenza or strangles, or arise out of an extension of inflammation from the larynx.

Symptoms.—As a rule, but with notable exceptions, bronchitis commences with shivering and the symptoms of a common cold; the first thing noted may be a cough and a rattling sound in breathing that in very marked cases can be heard at some distance. The breathing is somewhat quickened, the temperature raised, the appetite indifferent, and a general listlessness is observed as well as disinclination to movement. The pulse is increased in number and diminished in force, the ears and legs vary in temperature, being sometimes cold, sometimes warm. Thirst, too, is often noticed in the commencement of the disease. With the progress of the malady the cough occurs in paroxysms at frequent short intervals, and gives rise to very great distress. When the larger bronchi are chiefly affected it is louder and harsher than is the case when the small ramifications of the tubes become involved. Auscultation is here of much assistance, as by placing the ear on the chest at various points the peculiar sounds emitted will afford information as to the state and progress of the disease. Where the large bronchi are only or chiefly affected, a coarse, rough, or rattling sound will be heard plainly in the front and upper part of the chest; but if the smaller tubes are affected it may also be detected in a modified form by listening behind the shoulder-blade. Here the sound emitted is harsh as compared with normal breathing, and mixed up with it is a coarse or fine crepitation or crackling. The loud, harsh cough presently gives way to a softer one, attended with more or less copious expectoration of mucus, which varies considerably in thickness and tenacity. In these circumstances the chest sounds are quite altered, and the ear detects bubbling and wheezing in the tubes as the air passes through the accumulated matter within them. The patient's prospects of recovery would appear to depend largely upon the viscidity or otherwise of this matter and its possibility of removal.

Treatment.—It is important that remedial measures should be applied early, but too often the disease has gained a firm hold of the animal before professional assistance is called in or the gravity of the case is recognized. The severity of an attack may be mitigated by bold doses of anodynes, as chloral and iodide of potassium, with stimulants; but the disease, when fully established, cannot be cut short by any drastic measures, and the symptoms must be combated, the animal's strength maintained, and his general comfort attended to. The temperature of the stable should be

kept up to about 55° Fahr., and outside it a convenient place may be chosen to keep water boiling so that a pail or two of hot water may be brought into the stable to keep the air moist. The legs should be bandaged and the body warmly, but not heavily, clothed, a hood forming part of the suit worn.

If the throat shows signs of soreness, counter-irritation should be applied to it and along the front of the neck to the breast, and if the chest trouble is severe, an application of turpentine liniment to the chest-walls will be desirable. Mustard should not be chosen for this purpose, as the pungent, irritating vapour given off from it while on the skin provokes coughing and tends to add to existing distress.

Although we cannot induce the horse to expectorate in the ordinary sense of the word, yet we adopt those agents known as expectorants to facilitate the removal of mucus from the tubes, where its presence is causing so much annoyance. Electuaries of belladonna, in combination with camphor and ipecacuanha, or tartarized antimony, will be preferred, and especially where sore throat precludes the administration of draughts; but if these cannot be given without distress to the patient, other remedies of a nature too volatile to enter into an electuary may be chosen. Of these, compound tincture of camphor (paregoric elixir), chlorodyne, æther, nitrous æther, carbonate of ammonia, and tincture of squills are among those recommended; while the drinking water may be chosen as the vehicle for such salts as chlorate or nitrate of potash, and the bicarbonates of potash and soda.

Inhalation of steam, or rather, we should say, the vapour of hot water, usually affords relief, and may be made more potent by the admixture of a small amount of friars' balsam, camphor, or eucalyptus oil. These may be mixed with hot bran in a nose-bag, which should not be left on, but used while an attendant is standing by for a few minutes at a time only. With an abatement of the more distressing symptoms the cough in some cases proves obstinate and threatens to become chronic. Medicines may in such cases be advantageously administered in the form of bolus, and be composed of tar, powdered squills, opium and gum ammoniacum, or for opium may be substituted some other anodyne if it has already been given for some time in the course of the attack.

If during the early days of the disease the bowels are constipated as a result of the febrile state, they may be regulated by soft food and a few spoonfuls of linseed-oil given with it from day to day in preference to an aperient dose of medicine. Some glycerine may be introduced into the bowel, or soap and warm water enemata employed. The extreme debility that follows a severe attack may in some instances account for the persistency of the cough, and tonic treatment is then called for.

A fresh-made infusion of gentian, with small doses of carbonate of ammonia or alcoholic stimulants, is worth trial. Rather large doses of quinine, with nux vomica, give just the necessary fillip sometimes when convalescence is protracted. A considerable period of time should be allowed, with gentle and steadily increasing daily exercise, before the animal is allowed to return to his ordinary work, and the greatest care should be observed against exposure to wet or cold easterly winds.

CHRONIC BRONCHITIS

Except as a sequel to acute bronchitis, the chronic form is seldom met with. It differs from it in the absence of fever, the persistence of the cough, and the character of the matter coughed up. Slight causes are sufficient to aggravate the symptoms which are assumed to be due to the morbid irritability and lessened calibre of the small air-tubes by reason of the thickening of their lining membrane. The subjects of it are easily fatigued and their value much depreciated.

Symptoms.—These are in some respects the same as in acute bronchitis, but modified in intensity, thick wind and premature fatigue being most noticeable under exertion. There is at the same time an inaptitude for putting on flesh and a want of bloom in the coat. The cough, although less frequent than in the acute form, is much increased in certain conditions of weather, as where cold and wet follow upon a period of dryness and sunshine. It is also provoked by passing from a warm stable into the cold atmosphere without. Horses affected with chronic bronchitis are mostly heard to cough while feeding, and especially if the food is given dry.

Treatment may ameliorate the symptoms, and, with care, the subject of it may perform useful work; but it is seldom that anything like a radical cure is effected. Occasionally a young horse, under exceptionally favourable circumstances, will appear to grow out of it, but a trifling ailment is sufficient to bring it on again.

Careful dieting with linseed and damp food should be observed, avoiding all forage with the least suspicion of must or dustiness. The occasional but not habitual use of certain drugs has a beneficial effect. The agents most recommended are myrrh, soap, camphor, squills, carbonate of ammonia, digitalis, and tar in the form of bolus. Iodide of iron and arsenic are also employed with apparent good results.

CONGESTION OF THE LUNGS

Definition.—By congestion of the lungs is meant an undue fulness or engorgement of the pulmonary vessels with blood, and especially those concerned with respiration as distinguished from others engaged in the nutrition of the organs. It is convenient to consider this disease under two headings—A, as acute, and B, as passive or mechanical congestion. The acute form of the affection is most frequently met with in horses subjected to severe exertion and distress. In the second form it arises in the course of various forms of disease, and especially obstructive heart disease. It is also a frequent and fatal accompaniment of the specific fevers, and may complicate acute inflammation of many of the organs of the body.

Causes.—Congestion of the lungs follows upon a variety of disturbances in the health of the horse.

The acute form is frequently induced by excessive exertion without previous adequate training or condition, hence the number of cases occurring among hunters and steeplechase horses pushed beyond their powers with but little previous preparation. Fat young horses fresh from grass or the hands of the dealer are particularly prone to this disorder, especially when brought into town work and made to occupy badly-ventilated and otherwise ill-conditioned stables. The same causes that produce catarrh or common cold are liable to give rise to congestion of the pulmonary vessels, and the disorder is a frequent sequel to, or complication of, inflammatory attacks affecting other organs. As a mechanical congestion it is always present more or less in obstructive diseases of the valves of the heart. Here the blood, interrupted in its course through the last-named organ, is made to accumulate in the vessels of the lungs. Passive congestion of these organs mostly arises in the course of exhausting diseases, and particularly in that form of influenza termed "typhoid".

Symptoms.—In acute cases the symptoms are very urgent. Rapid but shallow breathing, "blowing" as it is called among horsemen, dilated nostrils, bloodshot eyes, head depressed and commonly held in a corner the least suitable for obtaining a supply of fresh air. The muscles quiver, the body is hot with perspiration, and the ears and legs are icy cold. Redness of the conjunctival membranes is not of that kind commonly seen in cases of acute inflammation, but of a darker colour, as might be expected in an animal whose blood is not receiving proper oxidation in the lungs. As a rule, the horse so affected persistently stands, but there are exceptions, some appearing to suffer acute pain and occasionally going down in a vain effort to obtain ease, while others, and by far the majority, become more or less dull and stupid. The heart-sounds are loud, and the pulse,

which is at first moderately full, becomes weak and compressible, the number being with difficulty counted owing to its rapidity and want of resistance to the touch. Auscultation yields a minute crepitating sound, besides a harsh bronchial noise in the place of the ordinary murmur of healthy respiration, and later there are areas in which the sounds are much subdued.

Cases of pulmonary congestion from excessive exertion, although exhibiting the severest distress, are more likely to recover than the so-called passive form when complicating diseases of a febrile and exhausting nature. Whether as a result of overtaxing the animal's capacity, or as a sequel to other affections, its course is rapidly fatal unless checked by treatment.

Treatment.—In attempting any kind of treatment the object in view is to relieve the overtaxed pulmonary vessels of their surplus blood, and to impart tone to them and to the embarrassed and enfeebled heart. If this can be done promptly the battle is half-fought. If the hunting man is horseman enough to recognize when his mount is "pumped out", he may accomplish it by pulling up with the horse's head to the wind, slacking out the girths, hand-rubbing the legs, pulling the ears, and giving the contents of his flask to the exhausted steed. Many a horse is thus saved by a judicious rider with that intelligent sympathy which every man should have who rides to hounds. Too many do not possess it, or assume that a hired horse must be in the pink of condition and have no weakness that shall curtail the pleasure of his rider; "the last ounce", as the phrase goes, is got out of the animal by whip and spur, and he finally comes to a standstill, or a check occurs too late to save a high-spirited animal that will go till he drops. In such a situation the propriety of bleeding can hardly be called in question, but it is, comparatively speaking, a lost art among horsemen, who at one time were always ready to perform the operation with more zeal than judgment. The exhausted hunter, after first being allowed to recover himself, should be led to the nearest stable and put into the most airy box obtainable. The veterinary surgeon, when summoned, may not consider it too late to bleed, especially if the pulse is found fuller after a stimulant has been given. Every effort should be made to restore the circulation by friction, vigorous wisping of the body with straw, chafing the legs and ears, bandaging, and clothing. Alcoholic stimulants, such as gin or whisky, are mostly obtainable without much delay, and should be given at once or as soon as the animal has recovered his "wind". Some authorities recommend carbonate of ammonia with digitalis, for which they claim the double advantage of increasing the power and diminishing the number of the heart's contractions. The doses, whether of alcohol or other

chosen agents, should be moderate in amount and repeated hourly so long as symptoms of distress continue.

There is a general consensus of opinion in favour of the application of mustard to the sides of the chest, although a few dissentients of unquestionable authority have thrown doubts upon the propriety of counter-irritation. The practice appears to have very marked and rapidly beneficial effects in many cases, and in our judgment should be promptly resorted to, but hot water may be substituted where any special objection against mustard or strong liniments presents itself. The convalescent should receive unremitting care, as there is much tendency to recurrence, as also a danger of pneumonia following the attack. Besides the importance of pure air and comfortable conditions generally, the state of the bowels must be made a matter of attention, and if a tendency to constipation exists which a laxative diet is not sufficient to overcome, a small dose or two of linseed or castor oil or sulphate of magnesia may be given, but in no case should aloes or any drastic cathartic be employed.

Post-Mortem Appearances.—Examination of an animal that has died of this disease shows the lungs to be very dark in colour; they are, nevertheless, compressible, and do not exhibit that solid condition and friable texture common in inflammation of the lungs. Where the overcharged vessels have given way, blackish red patches of lung are seen here and there infiltrated with escaped blood.

INFLAMMATION OF THE LUNGS, PNEUMONIA

Definition.—Inflammation of the true lung substance. This may exist as an independent disease or it may complicate an attack of bronchitis.

Causes are all such as induce catarrh, or inflammatory conditions of other parts of the respiratory apparatus. It may arise as a sequel to pulmonary congestion, or be induced by direct irritation of the air-tubes, as when medicines, in being given, "go the wrong way". It also follows on bronchitis by a downward extension of the inflammation into the substance of the lungs. Neglected colds and damp unhealthy stables are among the most frequent of the many causes that contribute to this disease. Influenza and strangles not unfrequently terminate in a fatal pneumonia, and there is reason to believe that the disease is sometimes in itself specific and contagious. In this connection it has often been noticed to spread from animal to animal in the entire absence of any obvious cause of a common character. Septic pneumonia, such as occurs in the "joint ill" of foals, and other forms of blood-poisoning, is by no means an uncommon variety of this disease.

Symptoms.—There is a train of symptoms that may be called common to all inflammatory disorders of the respiratory system, and only the expert can, with any degree of accuracy, distinguish between them. Following upon catarrh, it cannot be said precisely when pneumonia commences, but there will be increased temperature and accelerated breathing, though in the latter connection not to the extent observed in acute pulmonary congestion. The mucous membranes exhibit a rusty or brick-red colour, and the pulse is small and irritable. The skin and extremities will be more or less cold, but scarcely with the icy coldness of acute congestion, nor will the sweating and trembling of that condition be present as a rule.

There is very little appetite, a tendency to constipation, and the urine is highly coloured and small in quantity. While the cough of a common cold and of bronchitis is accompanied with a more or less considerable discharge of mucus from the nostrils, there is but little in pneumonia, and what there is is thin and frothy, but as the disease advances there is a fœtid odour to the breath, and the matter expectorated is more or less reddened from admixture with spoilt blood and other decomposing material.

If the chest sounds are listened to throughout an attack they will at first be observed to be louder and harsher than in health, but as the air-tubes become charged with inflammatory products they undergo modification and give out minute crepitant or crackling sounds. When the air-cells and small tubes become actually filled with these products, and air is altogether excluded, crepitation ceases as a result of consolidation of the lung substance. The bronchial sounds in the upper part of the chest, however, are more or less exaggerated. Percussion applied to the chest by means of the fingers will enable us to make out with more or less accuracy the part of the lung which has undergone solidification, as there is an absence of resonance over the part where no air passes in or out. In speaking of congestion of the lungs, the rapid progress of the disease has been referred to, and in this it differs from pneumonia, which may take a week in reaching a crisis, and probably two or more weeks before the symptoms have quite disappeared, a high temperature being maintained for many days. Relapses of a febrile character, at a time when considerable progress has been made, are not uncommon, and would seem to be due, in many instances, to infection of the blood with morbid matter, resulting from the disintegration of lung tissue.

Treatment.—Before determining what method of treatment should be adopted, it is well to consider the history of the individual and the circumstances that have led up to the illness. Also his condition, whether it is one of poverty and weakness—if the animal is an aged one or a

young and full-blooded creature fresh from the liberty of pasture. These and other circumstances affecting individuals will materially influence the line of treatment to be pursued. In the former case we should not recommend measures of depletion of any kind, but in the latter these might with advantage be sometimes employed. In dealing with this disease modern practitioners attach much more importance to hygienic conditions than used to be the case. Good nursing, the maintenance of an equable temperature, both of the skin and stable atmosphere, scrupulous cleanliness, ample ventilation, and judicious feeding have now become recognized as indispensable to successful treatment. Friction of the body and extremities, the employment of suitable clothing and bandages, frequently removed and replaced, are not less important. Saline febrifuges are generally approved, and of these acetate of ammonia, nitrate and chlorate of potash, and sulphate of magnesia judiciously administered are the most appropriate.

Plenty of bland mucilaginous fluids, as linseed tea and barley-water, and an unlimited quantity of drinking-water, should be allowed. When the febrile symptoms have abated, and extreme prostration or fœtid breath has to be combated, there is benefit to be anticipated from the use of quinine, with the free use of alcoholic stimulants, as whisky, port-wine, or good ale, and the animal's strength will be most speedily regained under the influence of such things as beef-tea, eggs, and milk. The methods of administering the agents named will depend upon the presence or otherwise of irritability of the throat. Where this is great, with much cough and difficulty in swallowing, electuaries may be chosen, unless the patient can be induced to take them in drinking-water. In all pulmonary affections, draughts require to be administered with the greatest care, and in some instances must be altogether withheld. Where it is found necessary to adopt the latter course, spirit of wine in ounce or two-ounce doses may be administered in the drinking water as often as may be required. Want of appetite after a severe illness of this kind is a troublesome feature, and the old remedy of gentian, either in the form of powder or of compound infusion, with a mineral acid, as sulphuric or nitro-hydrochloric, afford the best results.

External Applications.—The efficacy of counter-irritation has been called in question by men whose attainments should command respect, but they are in a minority, and most practical veterinarians are agreed that the greatest benefit is often secured in a very short time by the prompt application of a mustard plaster, or a smart liniment of turpentine or cantharides, to the sides of the chest. As an alternative to this mode of treatment, heat and moisture to the surface may be applied by means

of rugs dipped in hot water and wrung out, or by the use of the hot pack, great care being exercised in changing them to avoid a chill in the intervals. Where practicable, the employment of hot smoothing-irons is to be preferred. Here a hot rug is first placed on the sides of the chest, with a dry one over it, and flat-irons are applied first to one side and then to the other, or to both at the same time, as may be convenient.

BLEEDING FROM THE LUNGS—HÆMOPTYSIS

Bleeding from the lungs and bronchial passages is not of common occurrence in the horse, but sufficiently so to warrant a reference to it here.

Causes.—The causes that bring it about are: (1) External violence, as when the chest is punctured by a stake or other sharp instrument; (2) undue fulness of the vessels of the lungs or bronchial passages, as in bronchitis, pneumonia, and obstructive heart disease; (3) ulceration of the tracheal or bronchial mucous membrane, as in glanders and tuberculosis, &c. Some cases come on during severe exertion and violent coughing without any other obvious reason.

Symptoms.—Pulmonary, like nasal hemorrhage, is usually sudden in its onset, and may be slight or severe. The blood is mainly discharged from the nostrils, but some also flows from the mouth. Bleeding from the lungs, when profuse, is invariably attended with outbursts of convulsive coughing, during which the blood, whipped into foam, is projected through the nose and mouth. Moreover, the bronchial tubes may become more or less blocked when the breathing becomes quick and embarrassed; the horse shakes his head, paws the ground, and manifests signs of distress. In slight cases, such as occur in pneumonia and some specific fevers, it appears in small amount as a blood-stained discharge from the nostrils.

Treatment.—Here, as in bleeding from the nose, the patient must be placed in a cool, clean box and kept perfectly quiet. A little ice in the water will be of advantage in arresting the hemorrhage, but it is doubtful if the forcible administration of medicines is not rather mischievous than otherwise. A little ergotin injected beneath the skin, and free sponging of the face with cold water, is as much as can reasonably be done.

If in his water the patient can be induced to drink 4 ounces of sulphate of magnesia on two successive days, benefit will result from a free action of the bowels. The body should be well clothed so as to keep the surface circulation active.

ASTHMA

Definition of Asthma.—This is a diseased state of the lungs, marked by paroxysms of difficult breathing and distress, accompanied by a wheezing sound. It is believed to be due to spasmodic contraction of the bronchial tubes, and from the peculiar suddenness of its appearance and disappearance it partakes of the character of a nervous disorder.

Causes.—These are very obscure, but seem to be connected in some instances with digestive disturbance, and by some authors are placed in the category of diseases of the digestive system. In susceptible animals it may be induced by breathing an atmosphere charged with irritating gases and other impurities. Besides a vitiated atmosphere, it is sometimes brought into existence by an attack of bronchitis, which is undoubtedly a factor in its development.

Symptoms.—The attacks may come on so suddenly that warning symptoms are brief, if at all observed. The breathing is at once difficult and distressing, and the duration of the attack altogether uncertain. Inspiration is less difficult than expiration, the latter being accomplished with a double action of the flank, and the whole body receiving a distinct jerk at the end of the movement. As compared with broken wind, which in some respects it resembles, the symptoms are more paroxysmal and acute, there is also greater distress, as evidenced by the anxious countenance, and the short irritable cough, which returns again and again in choking paroxysms. The discharge of small quantities of mucus as a result of coughing, and more or less elevation of temperature and loss of appetite, also serve to distinguish asthma from broken wind. Its sudden appearance is as remarkable as its rapid subsidence, but in some cases, after repeated attacks, it passes imperceptibly into that form of lung disease, known popularly as "broken wind". The subject of asthma is pretty sure of a recurrence of the affection at no very distant date.

Treatment.—An oily aperient, preferably linseed-oil, may be given first, and followed at short intervals with fairly large doses of such sedatives as chlorodyne, or camphor and belladonna, combinations of stimulants, as nitrous æther and valerian, and failing early relief a change of sedatives to chloral and the bromides of potassium and ammonium. Chlorodyne is especially useful, and rather bold doses are found to be safe and speedy in effect. All dry and dusty food should be removed, and no bulky aliment allowed. Linseed, boiled or scalded, is found to be the best food, and undoubtedly has a medicinal effect also. This, with a little bran and scalded oats, should be given in small quantities, and often. Different animals are differently affected by atmospheric conditions. Some experi-

ence relief in a moist air, while others are benefited by dryness. Cold air is always prejudicial. In dealing with this disease the effect of warm vapour should always be tried, either by means of a nose-bag containing moist bran or by allowing a pail of steaming hay to stand near the patient's head. To guard against a recurrence of the disease the dietary should be carefully regulated, and an oleaginous aperient administered every few weeks, according to the state of the bowels.

Severe exertion and fatigue, exposure to wet and cold and badly-ventilated unwholesome stables, by lowering the standard of health and irritating the air-passages, favour a return of the disease.

EMPHYSEMA OF THE LUNGS—BROKEN WIND

Definition.—This is a disease in which the air-cells of the lungs are abnormally dilated; the lungs themselves are consequently enlarged or ruptured and their elasticity impaired, as a result of which breathing is carried on with much difficulty and distress.

Causes.—While the proximate causes are not known with certainty, the remote or contributory ones are generally agreed upon. Hereditary predisposition no doubt conduces to its origin. It is observed to affect heavy or coarse-bred animals more frequently than the better-bred ones. This may be in part due to the fact that the former are more likely to live and work under conditions conducive to the development of the disease than those more carefully housed and fed and maintained for pleasure and sport.

It frequently originates in the excessive use of coarse innutritious bulky food, and especially in connection with greedy feeders. The exclusive use of damaged fodder contributes largely towards bringing about this disease, more particularly in the case of old animals. It is of common occurrence in ponies leading a life of idleness while receiving a superabundance of nutritious and bulky food.

All these facts go to show the disease to be, in a great measure at least, the result of dietetic causes.

Symptoms.—The cough is characteristic and different from any other in its prolongation—a double effort in expiration, which is easily seen in a well-developed case but may in others be mistaken for the quick breathing induced by exertion and excitement. When the patient is at rest and subjected to no excitement the cough is rarely heard, but it often occurs at the time of feeding, or follows a full meal and copious draughts of water. The chest sounds are very variable, but in nearly all cases those of the trachea and larger bronchi are exaggerated, and over different areas there

is a fine crepitus as well as an increased sound or resonance on percussion. In advanced cases flatulency is a marked symptom, and wind is frequently ejected from behind in the act of coughing. As the disease progresses, and the lungs undergo expansion, the walls of the chest become rounded in consequence of the ribs being forced outward. Premature distress invariably attends upon exertion, and the capacity for work is much abridged. Where work is enforced the body shrinks, while the abdomen becomes perceptibly larger than normal.

Treatment.—In no disease can so much be done for a horse by judicious dieting as in broken wind. Many a subject of it will perform useful work without undue distress for years in the care of a good horseman, the same animal being practically useless when transferred to the care of one who does not prepare and administer the food *secundem artem*. In these cases it is especially desirable to give nutritious food in small bulk and at comparatively short intervals, so that the patient may be well nourished but never distended. Every particle of dust should be separated from the corn by the sieve or other means, and no hay with a suspicion of must allowed, and even the best should only be given in small amount and always in the form of chaff previously damped in order to ensure proper grinding of the corn. Long hay may be dispensed with altogether, or, if given as an occasional treat, should be first steamed and the animal allowed to eat it at night or at a time when his services will not be required soon afterwards. Linseed is the food *par excellence* for a broken-winded horse, and although it is found that many tire of it, it must be dished up in different ways and a taste for it cultivated. It is often spoiled in the cooking, being allowed to cake in the bottom of the saucepan, and the novice invariably putting too much linseed in proportion to water and hurrying the process. Linseed-oil and cod-liver-oil in small quantities may be mixed with the food once or twice daily, or every other day; some horses become very fond of both, and show a distaste for their food without it. With regard to medicinal agents, these should be reserved for occasions when climatic conditions or other causes have induced unusual distress. The sedative agents recommended for asthma may be resorted to in this disorder, and usually result in abatement of the symptoms, but the digestive system must be our principal care, and those agents should be chosen which are most likely to disencumber the bowels, restore tone, and increase constitutional vigour. An occasional dose of aperient medicine has a most beneficial effect in relieving the embarrassed breathing, retarding the progress of the disease, and the same may be said of allowing ample time for digestion between feeding and working. The mineral acids and vegetable bitters are especially employed for this purpose, and for allaying the diffi-

culty in breathing much benefit is often obtained from a course of nux vomica and arsenic, the latter being given in solution and in combination with bicarbonate of potash. The good effects of arsenic are apt to cease with its discontinuance, and it is well to resume it again as occasion requires at suitable intervals.

PLEURISY, PLEURITIS

Definition.—Inflammation of the serous membrane that invests the lungs and lines the cavity of the chest. It may exist as a distinct disorder or complicate an attack of lung disease. One side only or both may suffer.

Causes.—Sudden chills, as exposure to cold draughts and cutting winds when the animal is overheated, swimming under like conditions when following hounds, invasion from contiguous structures, as in inflamed lungs. It may also come about by direct injury from external violence to the walls of the chest, or result from morbid growths. As a sequel to other diseases, as influenza and various forms of blood-poisoning, it is not uncommon.

Symptoms.—Marked rigors or shivering fits usually usher in the disease, and the temperature of the body shows a considerable rise. The respiration is quick, short, and painful, the animal manifesting acute pain as soon as the lungs are half inflated. Movement, especially turning, is extremely painful, and is demonstrated by a grunt or groan, and the same result follows the application of pressure between the ribs, and also percussion with the knuckles.

The belly marks a peculiarity of inspiration in this disease, which is diagnostic of pleurisy, especially noticeable during the act of expiration, when a ridge appears along the ends of the ribs, extending from the back of the brisket to the flank, which is not present at other times. Auscultation is a valuable aid in the diagnosis of pleurisy; the ear will detect in the early stage a very distinct friction sound as of two roughened surfaces passing over one another. This sound becomes louder and more distinct until the ordinary breathing murmur is overwhelmed in it, or is too weak to be detected. With the progress of the disease, water is effused into the chest when the rubbing or friction sounds cease. If the fluid accumulates it gives rise to various sounds, as the splashing of rain-drops, a subdued tinkling, or the dropping of water. The amount of fluid accumulated is sometimes very great, and it may for some time remain unaltered, but must eventually be either absorbed or by pressing on the lungs cause suffocation and death. Dropsical swellings here and there mark the advance of the disease. The loose tissues under the skin along the breast and belly

become infiltrated with fluid, and the sheath becomes enlarged from the same cause. The legs fill more or less, the countenance becomes worn and haggard, the extremities cold, and the belly drawn up at each act of expiration.

The pulse is at first hard and of increased frequency, but as the fluid is effused into the chest it becomes softened and smaller in volume, as well as weak and irregular, and the pain is less severe. The patient persistently stands with protruded head and dilated nostrils, which open and contract in a jerky, spasmodic manner.

Pleurisy is distinguished from other inflammatory chest diseases by greater pain, harder pulse, catchy breathing, and the short occasional cough which the patient endeavours to suppress, as also by the friction sounds and greater sensibility of the chest to external pressure.

Treatment.—In this disease benefit may be expected from counter irritation to the walls of the chest. Here we have but little substance intervening between the skin and inflamed part, and if mustard is beneficial in other inflammatory diseases of the chest it is doubly so in pleuritis. Though bleeding is not so generally practised as formerly, and altogether unsuited to the great majority of cases, there is reason to anticipate beneficial results from a liberal blood-letting at the commencement of the disease, where the patient is in plethoric condition and the attack is of an acute character. But even here it will be of no use, and probably harmful, if delayed to an advanced stage of the attack. In advocating bleeding for pleurisy it is not at any time to be employed on the aged or the weak, nor should it be resorted to where pleurisy follows upon any of the contagious fevers.

Particular attention should be given to the patient's surroundings, which should be comfortable and with every inducement to rest. A roomy, dry, and well-littered box is to be provided, so that no restraint be placed on movement, and ample ventilation should be allowed both night and day. The legs should be kept warm by woollen bandages frequently changed, and the intervals employed in hand-rubbing or wisping them with hay or straw. Warm clothing in the form of rugs and hoods is most essential, with the object of keeping up the circulation on the surface and extremities, and thus aiding in the reduction of inflammation in the affected part. For diet see Catarrh and Pneumonia. The application of moist heat to the sides of the chest is strongly advocated by some authorities, woollen clothes or rugs being dipped in hot water and applied to the chest by means of rollers or bandages, the heat being retained and evaporation prevented as much as possible by a sheet of oiled silk or gutta-percha, or a dry rug.

The medicines to be chosen are those most calculated to reduce tem-

perature and steady the heart's action in the first instance, and for this purpose alternate doses of aconite and belladonna are in repute. Salines, as the salicylates of soda, and glauber salts, sulphate of magnesia, nitrate of potash, and acetate of ammonia, are recommended as for pneumonia and other inflammatory disorders of the respiratory apparatus. To allay the acute pain which marks the majority of cases at the onset, such anodynes as opium and cannabis indicus may be employed. The latter is perhaps the greatest of pain-killers for horses, nor does it leave the depression which has been noted in the human subject. Subcutaneous injections of morphia may be employed for the same purpose, when objections exist to balls or draughts. The cases that most often end unfavourably are those which are said to "hang fire". They make very good progress up to a certain point, the temperature falls two or three degrees and then obstinately remains, and the patient goes back; it is then good treatment to repeat the application of mustard to the chest as recommended at first, or a liniment of cantharides may be used, or poultices of linseed-meal, in which a little mustard is mixed, may be applied for a day and a night or until improvement is noted. Where the disease takes the course last indicated, good nourishment with stimulants and tonics will be more likely to do good than those agents recommended for such as follow the more common course.

Fig. 208.—Tapping the Chest

In convalescence alcoholic stimulants, as gin or whisky, with quinine, gentian, and iodide of iron may prove helpful. Notwithstanding general improvement, a large amount of fluid will sometimes persistently remain in the chest and refuse for a length of time to undergo absorption. Iodide of iron, and those drugs commonly known as diuretics, are best calculated to

favour absorption. In some cases, however, it is necessary to remove the fluid from the chest bodily by means of an operation. A liberal diet and very moderate exercise should be allowed when the urgent symptoms have passed, but nothing amounting to work should be imposed for several weeks at least.

SPASM OF THE LARYNX

We have seen, in speaking of roaring and whistling, that the muscles which regulate the size of the opening into the larynx are liable to become thrown out of use as the result of paralysis. In the disease now to be noticed the same narrowing of the orifice takes place, but in an entirely different manner. In the one case it is the result of a paralysed state of a certain set of muscles (abductors) which open the larynx, while in the other it arises out of abnormal action or a spasmodic contraction of another set (adductors), whose natural purpose it is to close it.

Causes.—Spasm of the larynx may result from any sudden and violent irritation, and from milder stimulation when the larynx is in an irritable condition. The accidental entrance of food or other foreign agent will sometimes bring it about, and especially when the sensibility of the organ is heightened in the course of an attack of inflammatory irritation. Some of the most severe and dangerous cases, however, arise in the entire absence of any such condition, and from the manner in which they come and go it is clear that they have a nervous origin; but whether the actual seat of the disorder be in the brain or in the nerves of the larynx themselves cannot well be determined.

Symptoms.—It is seldom that any premonitory indications mark the oncoming of the disease. Horses who suffer from it usually enjoy good general health, and are mostly in fair condition. The attack almost invariably comes on suddenly, and, with few exceptions, while trotting or galloping. While moving along, the horse is noticed to come suddenly to a stand-still. The head is raised and moved from side to side, the face is pinched and wears an anxious expression, the nostrils are dilated, and after a brief arrest in the breathing a loud shrill noise is heard with each inspiration. In severe cases the horse breaks out in patchy sweat, the gait becomes unsteady, the breathing gasping and troubled, and the body is generally convulsed.

The paroxysm may quickly pass away only to return when the animal is caused to move, or it may be renewed from time to time at varying intervals for several hours, when it disappears, leaving the patient but little the worse for his trouble.

Treatment.—At the outset of the seizure the horse should be brought to a stand-still at once and allowed to remain in a state of quiet until the paroxysm abates, when he may be removed to the nearest stable. The body should now be well rubbed down and plenty of fresh air provided for. A draught, consisting of 2 ounces of tincture of opium in water, or, what is better, a subcutaneous injection of morphia, is to be administered and repeated in two hours if the symptoms do not abate. Hot bandages to the throat after an application of glycerine and belladonna will be found useful, with inhalations of warm vapour, and a dose of physic should be administered when the spasm has disappeared.

An animal having suffered one attack is frequently the victim of a second, and sometimes a succession of seizures may follow the first at varying intervals of days, weeks, or months. Where this is the case the greatest care should be observed to guard against overfeeding, severe exertion, and, as far as possible, against the inhalation of dust and irritating gases, and to avoid exposure to such sudden and extreme changes of temperature as are met with in passing from hot, foul stables into the cold air.

COUGH

A cough is a more or less violent expiratory effort, indicating irritation of some part of the breathing organs. The act is commenced by a deep inspiration, during which the lungs are distended with air. The larynx or entrance to the windpipe is then momentarily closed, after which it is forcibly opened by the contraction of the muscles of the chest and abdomen, when the contained air is expelled, carrying with it any offending matter to which the cough may be due.

The irritation by which coughing is induced may be direct or sympathetic, *i.e.* it may result from something brought into direct contact with some part of the respiratory tube, as cold air, dust, irritating gases, or it may be a sense of irritation transmitted by nervous influence from some other organ, as in the case of cough arising out of stomach derangement, worms in the bowels, teething, &c., &c. The sensibility of the respiratory passages is greatly enhanced when any part of them suffers from active disease, hence coughing is always present in such ailments as laryngitis, bronchitis, and pneumonia. Cough, moreover, is frequently associated with heart disease, especially with those forms that interfere with the pulmonary circulation and keep up a certain degree of congestion of the lungs.

As a means of diagnosis, much importance is to be attached to the character of the cough: (1) as to whether it is short and hacking, as in stomach and intestinal derangements, or long drawn out, as in chronic lung

disease; (2) whether it is occasional, as in pleurisy, or frequent, as in bronchitis; (3) whether it is moist, as in catarrh of the air passages, or dry, as in broken wind; (4) whether it is free, as in common cold, or painful and suppressed, as in laryngitis. Cough, it will be seen, is a mere symptom of disease, and not a disease in itself; and although usually associated with disorders of the respiratory apparatus, it is sometimes induced by nervous impulses excited in remote organs. The remedy for coughing is the remedy for the particular ailment out of which it arises, and every case must therefore be dealt with on its merits. The treatment necessary to allay the cough of laryngitis would have no beneficial effect in that resulting from intestinal irritation, for, while in the former case sedatives would be indicated, in the latter aperients and perhaps a vermifuge would be most promising of success. In the matter of treatment, therefore, the particular medicines and applications to be employed will be governed by the nature of the cause to which the cough is due.

HIGH BLOWING

The sound to which this term is applied is produced in the act of breathing while the air is being expelled from the lungs during forced respiration. It is most marked while the horse is doing a brisk canter, and becomes less audible in the gallop. It is always most pronounced at starting, and is recognized as a fluttering or loud vibrating noise. The degree of vibration differs in different animals, and it is distinctly more sonorous in some than in others.

High blowing is essentially a nasal sound, and although sometimes loud and shrill, it bears no comparison in point of quality with the noise emitted as the result of laryngeal disease in roarers and whistlers.

It is more especially observed in horses with thin skins, whose false nostrils are loose and capacious, and in animals of excitable temperament. In the writer's experience high blowers are conspicuous for the soundness of their breathing organs and endurance under exertion, and in a large practice in the examination of horses of every description he does not remember to have found roaring to be associated with this peculiar breathing sound. Increased nasal resonance or noisy breathing is sometimes the result of that type of conformation in which the face presents a narrow and pinched appearance across the region of the nose. In this condition the sound has the quality of that ordinarily heard in respiration, but much intensified.

It is readily distinguishable from roaring, and is not to be regarded as a state of unsoundness.

8. CONSTITUTIONAL DISEASES

RHEUMATISM

Definition.—Rheumatism is a specific constitutional disease, sometimes assuming an acute febrile character. It is specially marked by local manifestations of pain of varying degrees of intensity, with a tendency to shift from place to place, and to recur periodically. Horses of all ages are liable to it, but it is most prevalent in the aged.

Causes.—Heredity is undoubtedly a factor in the causation of rheumatism, and, as in gout, the disease would appear to be due to some incomplete elaboration of the nutrient elements of the food, whereby a rheumatic poison is generated in the body and brought into activity by certain extraneous causes. Among these may be mentioned unsanitary surroundings, cold, damp, and vitiated stables, and damaged fodder. Any condition tending to reduce an animal's vitality or bring him below "par" increases his susceptibility to attack. Seasonal influences, as exposure to the biting east winds of spring and autumn, are often accountable for attacks of this disease in susceptible subjects. Horses brought from a hot stable and then, while heated, compelled to stand without clothing, exposed to wet and cold, readily contract the disease. Animals subjected to habitual exposure, but without those sudden alternations from the warmth of the stable to the draughty street corner, are much less liable to contract the disease than the animals living in hot stuffy stables.

Rheumatism in its acute febrile form not infrequently complicates an attack of influenza, strangles, or pneumonia, or follows upon it in the course of convalescence.

Symptoms.—Rheumatism may present itself as an acute fever with manifestations of local pain, or it may assume a chronic and less severe character.

In the former case the animal shows marked indications of constitutional disturbance, notably a high temperature, quick pulse, increased breathing, hot skin, injected eyes, inappetence, and constipation of the bowels. Locally, the disease may centre itself in one or another of the joints of the extremities, or in the tendons and ligaments of the limbs, or in the muscles. Whichever structure is involved, the part becomes more or less swollen, hot, and intensely painful, so much so that the upright posture is maintained with difficulty, and only at the expense of considerable suffering. The disease may be confined to one extremity

only, or it may involve two or more. In the chronic or sub-acute form of the disease there is seldom any obvious disturbance of the system, the pulse, breathing, and temperature remain normal, and the appetite is undisturbed. The disease mostly attacks the limbs, but may also implicate the muscles of the loins, producing lumbar rheumatism or lumbago. The seat of attack may or may not be enlarged, but more or less heat and tenderness is generally observed in it. When swelling of the structures appears it is usually firm, and seldom altogether disappears. The pain and lameness is liable to vary in severity from day to day, and to shift from part to part, and from limb to limb, so that the lame leg to-day may be the sound one to-morrow, and vice versa. An animal once affected with rheumatism seldom escapes a second attack, and the liability to recurrence of the disease becomes greater as time goes on. Many of those large swellings found on the limbs of horses involving the bones are of rheumatic origin, as are also others seen in the tendons and ligaments of the legs. The joints of horses are frequently found to become gradually enlarged by repeated attacks of the disease.

Treatment.—The reduction of temperature in those sudden and acute attacks of rheumatism referred to is of first importance, and this should be attempted by the administration of successive doses of salicine. The salicylate of soda is perhaps the most useful salt in rheumatic affections, and doses of 4 to 8 drams are not considered excessive. If the heart is weak and too easily depressed, salicylic acid may be preferred as having less action upon that organ. This treatment may be accompanied by a mild aperient, preferably of a saline nature, as sulphate of magnesia or soda, and if the symptoms do not rapidly abate salicylates may be exchanged for iodide of potassium, with bicarbonate of potash or soda in the drinking-water. The diet should not be stimulating, and if the allowance of corn has been full it should be considerably reduced. Where very acute pain is evinced it may be desirable to place the patient in slings, and to employ anodynes both internally and to the swollen parts (see section on anodynes). Hot fomentations and bandages to the inflamed parts, friction with the hand, aided by liniments of soap and iodine, also afford considerable relief.

Recurrent rheumatism at particular periods, as in moulting and during the prevalence of east winds, may be combated in advance by a course of soda or potash and a laxative dose of medicine a little while before the usual time of attack. Good drainage, a dry stable, and plenty of dry bedding are particularly desirable for horses that have been previously subject to rheumatism.

LYMPHANGITIS—WEED

Definition.—A constitutional disorder, with local manifestations of an inflammatory nature, affecting the lymphatic glands and vessels of the limbs. It is usually confined to one hind extremity, but occasionally involves both, and sometimes attacks a fore one.

Causes.—Predisposition to this disease is especially marked in heavy coarse-bred draught horses with a thick skin, round fleshy legs, and lymphatic temperament. It may, however, and occasionally does, attack the lighter breeds, but this is of comparatively rare occurrence. Lymphangitis seldom appears before the adult period of life has been reached. Animals out on grass enjoy an immunity from it, and it is only when they are housed and liberally fed on highly stimulating food in the course of active work that the disease presents itself.

Under these conditions the disorder appears to be excited by insufficient exercise or a temporary respite from work; hence it is sometimes termed "Monday morning disease", from the fact of its frequent occurrence after Sunday's rest. The intimate cause of the malady cannot be clearly stated, but it would seem to have its origin in some vitiated state of the blood, either resulting from imperfect assimilation of the food or the too tardy elimination from the system of the waste products of the wear and tear of the body.

Symptoms.—Two groups of symptoms are clearly manifested in this disorder; one group has reference to the diseased limb, and the other to the general system. In respect of the former it is observed to become suddenly enlarged, hot, and painful. The swelling commonly extends from the foot to the stifle, but may be less extensive in the milder forms of attack. The animal shows intense lameness, and will sometimes hold the leg suspended in the air as evidence of pain. The glands in the groin are swollen, and in the more severe cases an oozing of a straw-coloured fluid appears upon the skin.

The constitutional symptoms are ushered in by rigors or shiverings, an accelerated pulse, and hurried breathing. The temperature rises two or three degrees above the normal standard. The mouth is hot and clammy, the bowels constipated, and the urine thick, and somewhat dark in colour, and loaded with solid matters. Under judicious management the fever symptoms subside in thirty-six to forty-eight hours, and the local symptoms show signs of abatement.

Treatment.—As a rule to which there are but few exceptions, a bold dose of aloes in the form of a ball should be promptly administered, and

while waiting for its effects relief may be afforded by warm fomentation and the employment of soothing emollients to the swollen limb. The anodyne effects of warm water may be increased by the addition of opium and solution of the acetate of lead, and the emollient chosen may be improved by the addition of extract of belladonna or cocaine.

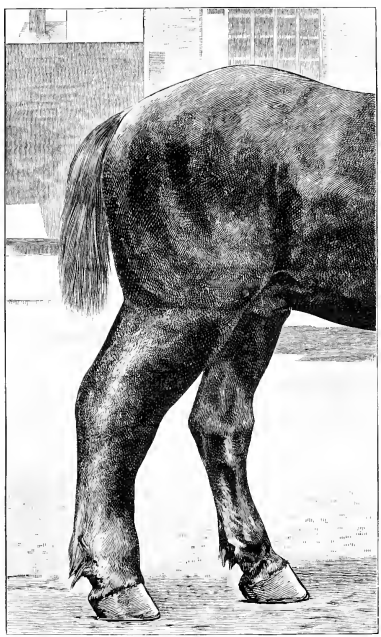


Fig. 209.—Lymphangitis

Diuretic agents may here be employed with great promise of success, as they stimulate the kidneys to carry off the morbid material in the blood. Nitrate and bicarbonate of potash is a convenient form in which to give diuretic drugs. Sometimes benefit results by a free scarification of the swollen limb, *i.e.* making a number of small punctures through the skin with a fine lancet.

Movement during the first two or three days is very painful, and although a reduction of the swelling and greater mobility of the limb is the immediate result, it appears to increase the inflammatory action afterwards. With the first subsidence of pain and swelling, short walks at frequent intervals may be recommended as reducing the liability to permanent thickening. The appetite is generally impaired at first, and should not be indulged immediately when it returns; a low diet during the period of convalescence being all-important in the matter of treatment. Grass and young vetches or other green food should be supplied, if obtainable, and corn withheld until a good deal of exercise can

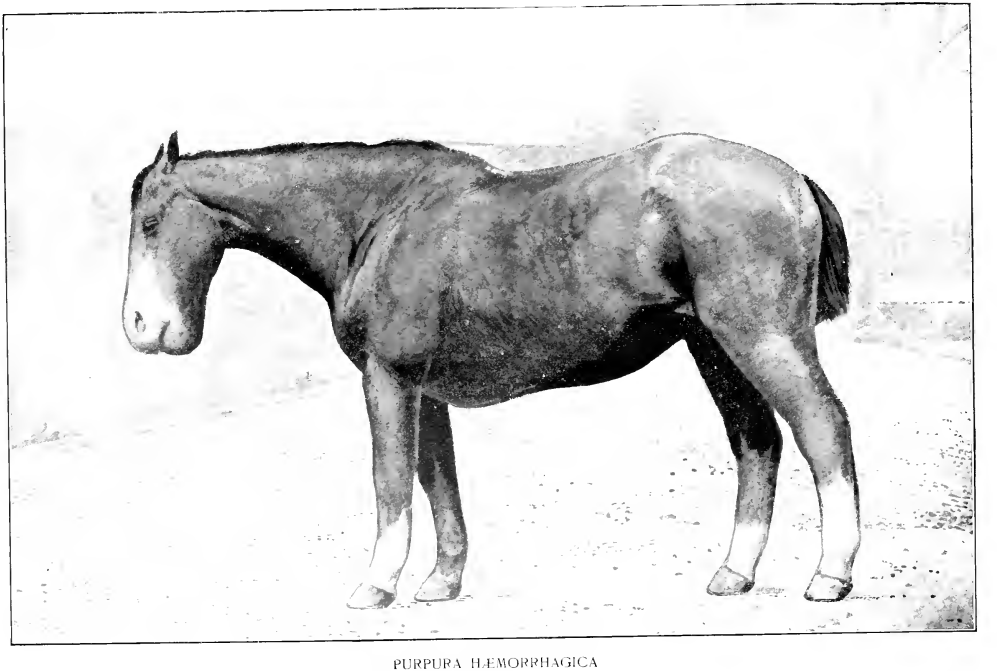
be taken. In the absence of green fodder, bran mashes, carrots, and a moderate amount of hay should be given. It invariably results that more or less permanent thickening remains after the acute symptoms have subsided, especially in the more depending parts of the limb. This, however, may be in some measure obviated by repeatedly subjecting the limb to brisk rubbing with a straw wisp and afterwards to a course of massage. Increased susceptibility usually follows the first attack. Animals so predisposed require special attention and management. In this connection walking exercise should be given whenever a rest-day comes round, and the food ration should be diminished. An aperient dose of medicine, given every three or four months, will greatly assist in warding off an attack.

PURPURA HÆMORRHAGICA

Definition.—A disease involving the entire system, and believed to be connected with changes in the composition and character of the blood, leading to rupture of the small vessels and the development of blood spots and patches in the skin, the mucous membrane of the eyelids, the nose, and various parts and organs of the body. Examination of the blood, both before and after death, show the white cells or corpuscles to be in excess of the normal amount, and the red corpuscles to be very soft and sticky, so that they adhere together in irregular masses, instead of arranging themselves in rows one on the other as they are seen to do in health. Moreover, many of the white corpuscles are broken up, filling the blood with granular débris.

Causes.—But little can be said as to the precise cause of purpura, but from the history of the disease, and the changes observed in the blood, there is ground for the belief that it is due to an organic ferment acting upon its corpuscular elements, and through them disordering the general nutrition of the body and that of the vessels in particular. It is best known as a sequel to certain fevers and affections of a debilitating character—as influenza, strangles, pneumonia, and pleurisy,—but it also occurs in animals while in health, and especially those in a plethoric condition. Bad ventilation and indifferent drainage are suspected of being sometimes concerned in the induction of this disease, but how or in what measure it is impossible, with our present knowledge, to determine.

Symptoms.—The onset of the malady is sometimes very sudden, and especially so in those cases where the victims are full-blooded or plethoric. The first signs are either a swelling of the lips or a trickling of blood-stained fluid from the nostrils, or both these symptoms may appear at the same time. The swelling then extends up the face until the head



PURPURA HÆMORRHAGICA

PLATE XXXIII

becomes generally enlarged and unsightly, and the breathing considerably interfered with. In many instances attention is first directed to enlargement of one or more of the legs, or to a soft doughy swelling beneath the belly.

The lining membrane of the eyelids, or the nostrils, or both, becomes spotted over with extravasated blood, and in some cases blood-stained fluid oozes from the skin at numerous points. The urine also may be discoloured by admixture with blood.

Purpura is always attended with a good deal of prostration, a varying amount of fever, and general constitutional disturbance. In cases where the swelling is considerable, and the disease protracted, sloughing of skin in the region of the lips, or from the heels, is not unlikely to occur.

Treatment.—Good sanitation and hygiene are matters of the first importance in dealing with this affection. A roomy, well-ventilated loose-box with efficient drainage should be provided for the patient, and the floor should be strewn daily with carbolic solution, or some other equally efficient disinfectant. The body is to be well clothed and bandages applied to the legs with the object of keeping up the surface circulation, while at the same time a free and plentiful supply of air is allowed both night and day. The strength of the animal should be supported by good manger food, suitably prepared by boiling and scalding, as well as by eggs, beef-tea, &c. Stimulants, in the form of whisky or gin, will be found to aid materially in supporting the powers of life and guarding against complications. As to drugs, turpentine with tincture of perchloride of iron are generally employed with the object of arresting hemorrhage and restoring the integrity of the red corpuscles. One ounce of each of these may be given in a pint of gruel morning and evening. A method of treatment which has been attended with marked success, both in this country and on the Continent, is that of injecting into the trachea or windpipe a weak solution of iodine in iodide of potassium. Four grains of the former to 8 or 10 of the latter, dissolved in an ounce of water, suffices for a dose.

Should the bowels be constipated, a little linseed-oil may be given in the food twice a day until a better condition is induced, but it should not on any account be carried to the extent of exciting purgation.

Where sloughing of skin takes place the wounds will require to be freely and repeatedly disinfected with one or another of the agents commonly used for this purpose.

When this disease appears in a mild form, as it sometimes does, it is termed by some scarlatina. There is, however, no disease of the horse which in any way resembles scarlatina, either clinically or pathologically.

HÆMO-GLOBINURIA

Definition.—Hæmo-globinuria is an acute blood disease characterized by sudden and severe lameness in one hind-limb, general paralysis, and dark discoloration of the urine, which is loaded with albumen. This disease used to be called hysteria, because first observed in mares. It is found, however, to be equally prevalent in geldings, and stallions are

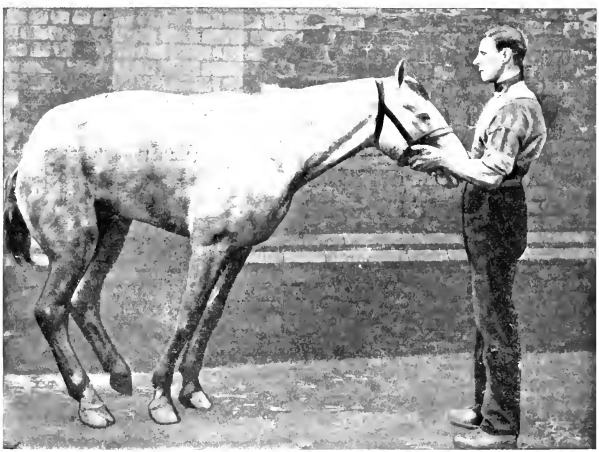


Fig. 210.—Horse Suffering from Hæmo-globinuria

also sometimes affected by it. It usually comes on after work following upon a short period of rest. Horses in high condition who receive large rations of highly nutritious food are specially liable to it.

The late Professor Williams described the deposit thrown down on the addition of an acid to the urine as nitrate of urea. In 1883 Professor Axe combated the view enunciated by Williams and others who regard the disease as the outcome of an immoderate accumulation of urea in the blood, and he adduced a large amount of chemical and pathological evidence in support of his contention.

In regard to the condition of the urine the Professor showed by a

series of chemical analyses:—1. That the precipitate thrown down on the addition of nitric acid and subsequent boiling is essentially albumen, and not urea as was stated by Williams. 2. That the discoloration is due to the colouring matter of the blood. 3. That while the amount of urea contained in the urine varies in different cases, it cannot be said to exist in any abnormal proportion. He further stated that the simple presence of urea in the serum of the blood, as referred to by Williams, is no indication of its being the disease-producing agent, inasmuch as urea is normally present in it. As to the specific gravity of the urine, the Professor observed that in none of the cases to which his attention had been directed had any marked increase been observed. In respect of the composition of the urine, he had noticed a considerable diminution in the amount of the calcium carbonate, and a notable increase in the ammonio-magnesium phosphates.

In speaking of the condition of the tissues after death he dwelt on the general septicæmic character of the changes, and specially referred to their œdematous condition. In a case recently brought under his notice the amount of fluid contained in the muscular and hepatic tissues was estimated and compared with that contained in the same structures in health, with the result stated below.

Estimation of Moisture in Muscle Tissue of Horse suffering from "Azoturia".—1. From the psoæ muscles 8 ounces or 3840 grains of flesh were removed and correctly weighed. 2. On some of the fluid being removed, by squeezing, it was found to have lost 1050 grains. 3. It was then minced up, and placed in a water-bath (the temperature not exceeding 150° Fahr.) for 24 hours, and again weighed, but the weight was found to be constant:

Water	... ...	2717 grains
Flesh	... ...	1123 „
		3840 „

There being present in the muscle water equal to 70·7 per cent.

Estimation of Moisture in Hepatic Tissue of a Horse suffering from "Azoturia".—1. Eight ounces of liver were taken and correctly weighed. 2. On some of the fluid being removed, by squeezing, it was found to have lost 1125 grains. 3. The liver was now minced up and put into a water-bath (temperature 150° Fahr.) for 24 hours, and again weighed, when it was found to have lost 2478 grains. 4. It was then put into the same bath for 12 hours longer, at the end of which time it was again weighed, but found to be constant:

Water	...	...	...	...	...	2478 grains
Flesh	...	...	...	...	...	1362 „
						3840 „

There being present in the liver water equal to 64·5 per cent.

Estimation of Moisture in Muscular Tissue of a Horse in Health.—A piece of psoæ muscle was taken from a horse and weighed. After the water had been expelled, it was found to have lost 50·37 per cent of moisture.

Estimation of Moisture in Hepatic Tissue of a Horse in Health.—A piece of liver was taken from a mare and weighed. After the water had been expelled, it was found to have lost 44·2 per cent of moisture.

Analysis of Urine in Health.—Three samples of urine were taken from three mares, and yielded respectively the following proportion of urea:—

1st sample	...	...	...	...	11·9 parts per 1000	
2nd sample	...	...	...	...	12·4 „	„
3rd sample	...	...	..	...	11·38 „	„

When treated with peroxide of hydrogen and tincture of guaiacum they gave no coloration, showing the absence of blood; when a small quantity of blood was added to the urine the hydrogen peroxide and guaiacum gave a distinct blue coloration.

Analysis of Urine in "Azoturia".—On Wednesday, June 13th, 1883, a portion of urine removed from a bay cart mare suffering from "Azoturia" was submitted for analysis.

Physical Characters.—Colour, in bulk, chocolate-brown; viewed in a test-tube, bright red, transparent, somewhat thicker than water; a small amount of granular matter visible in suspension. Specific gravity 1·015. To test-paper it gave a distinctly alkaline reaction. On the addition of nitric acid there was no effervescence; on being boiled a flocculent precipitate of albumen was thrown down. A portion of urine was taken and tested by the guaiacum test previously employed for the healthy urine, when a beautiful blue coloration was produced, indicating the presence of blood. A portion of blood from the same animal afforded the same reaction. The total solids were equal to 30·36 parts per 1000, and were of a bright-red hue, due to the presence of the colouring matter of the blood, and were estimated according to Neubauer's process. The urea was estimated by Russell and West's process. The ash or total saline matter was found to be equal to 4·61 parts per 1000. The ash contained a very large amount of iron, probably derived from the constituents of the blood. The ammonia was estimated by Schlosing's method, and found to be equal to ·0039453 parts of urea per 1000.

Proportion of Chief Constituents in 1000 parts.—

Water	969·64
Urea	11·59
Ash	4·61
Hippuric Acid ... ... } Extractives ... ... } Blood and other matters }	14·16
	1000·00

From a full consideration of all the facts and circumstances which his investigation had revealed, he was constrained to look upon the term "Azoturia" as a misnomer which could not be sustained in any sense whatever.

Causes.—The immediate cause of the disease is in some way connected with good living, and the blood has been stated to be surcharged with nitrogenous matter. This is very likely to be the case, but there is no scientific proof of the truth of the proposition. That a change is induced in the blood by a short period of work after two or three days' rest is true, and whatever that change may be it is marked by an escape of albumen and colouring-matter of the blood with the urine.

Symptoms.—The attack is usually very sudden; the subject may all at once become dead lame behind, as if from a broken limb, or severe injury to the loin; the muscles of the quarter are spasmodically contracted and hard, the animal breaks out into a profuse sweat, and the breathing becomes hurried and difficult. There is great discoloration of the urine, which may be of a dark-red or even porter colour. Sometimes there is difficulty in staling, when it becomes necessary to empty the bladder by means of the catheter. In a short time the animal falls, and is unable to rise. While on the ground he fights convulsively with the fore-limbs, and raises his head to his side as if suffering abdominal pain. The membranes of the eyes and nose are intensely reddened, the pulse is quick and full, and the temperature increased.

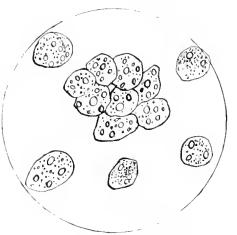


Fig. 211.—Cells of Liver of Horse affected with Hæmo-globinuria

Treatment.—A bold dose of aloes should be promptly administered, and, if possible, the animal should be slung. This is one of the few diseases in which some veterinary surgeons advise bleeding; no doubt the readiest way to reduce any deleterious matter which the blood may contain. A sack containing a large quantity of hot bran or other poultice

completely covering the loins gives relief to the cramped muscles, and facilitates the action both of skin and kidneys. Enemas of warm water should be thrown into the rectum. When aloes have acted freely diuretics should follow, preferably spirit of nitrous ether, as being stimulating and sustaining. Should the convulsive movements of the limbs and general excitement be considerable, a dose of chloral hydrate should be given, and repeated if necessary. If there is not a free passage of urine the catheter should be used, and the water drawn off from time to time as

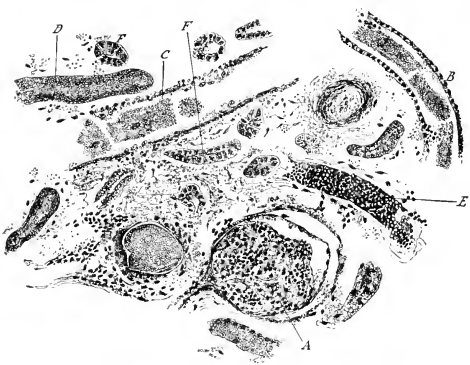


Fig. 212.—Section of Kidney of Horse affected with Hæmo-globinuria

A, Glomerulo-nephritis, Degeneration of its Walls. B, Renal Tube containing Granular Casts. C, Renal Tube, showing D, Large Granular Cast from Urine Tube. E, Vein, showing Engorgement with Blood. F, Small Tubes of Henle (healthy).

may be required. Soap liniment, with plenty of friction, may be applied over the loins and quarters where rigidity of the muscles exists. The diet should be low, and of a laxative character. Many horses remain crippled for a considerable period after the acute symptoms have passed away, and some never recover the complete use of their hind-quarters. The result of the disease is to cause rapid wasting of the muscles of the croup and thigh, and this must be met by a long run at grass, with blisters to the part, and the daily administration of nerve tonics. All cases of this kind demand attention from a qualified veterinarian. These symptoms are such as are commonly seen in the more acute cases, but there are others in which the urine does not become discoloured nor does the animal display those acute symptoms of lameness here described. In these cases the horse

is indisposed, with slight lameness in one of the legs, and until the urine has been examined there is nothing to indicate the nature of the malady from which he suffers.

A little acid applied to the urine reveals at once the nature of the disease by causing the coagulation and deposit of albumen.

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9. CONTAGIOUS DISEASES

INFLUENZA OF HORSES

A low form of catarrhal disease affecting the horse has for a long time been distinguished from common catarrh by the term influenza or distemper. It has existed in this country as far back as veterinary history extends, prevailing generally in the spring of the year, reappearing sometimes in the autumn.

Influenza attracted a special attention in 1872, in consequence of an extensive outbreak in the United States, causing enormous loss among horses belonging to the tramway companies. In consequence of the swelling and inflammation of the eyes, which is in many cases one of the symptoms, it acquired the name of "pink eye", but at the time the American veterinary authorities admitted that there was nothing in its character to distinguish it from the old form of influenza, and they ascribed the excessive mortality to the injudicious treatment to which sick animals were subjected. The tramway companies insisted on keeping them at work after the indications of the disease had appeared, with the result which has been referred to.

The new term "pink eye" was accepted in this country as evidence of the existence of a new disease among horses in the States, and considerable alarm was created among horse-owners, who realized the risk of importing the disease from America, an event which really occurred, but not until several cases of what was considered to be "pink eye" had been detected in different parts of England. It may be observed here that the swelling and redness of the eye had always been recognized as a symptom in certain cases of influenza, and the older practitioners insisted on this fact when the attempt was made to substitute "pink eye" for influenza. The popular feeling, however, was too strong for them, and to this day cases of influenza, associated with swelling of the eyelids and redness of the lining membrane, continue to be described as cases of "pink eye".

Causes.—As influenza affects a considerable number of animals which are associated together in large establishments, the idea naturally arose that the disease was spread by contagion. In opposition to this theory there is the evidence that one case may be followed by another at the other end of a large stable. In other instances a large number of animals are attacked simultaneously. The disease also appears in certain localities, in which it rages for a time and then rapidly ceases without any apparent reason. In favour of the contagion theory it is urged that the introduction of a sick horse into a healthy stable is followed by the propagation of the disease, and that the introduction of horses into infected stables has, at least in many instances, been followed by an outbreak of the malady. It is undoubtedly expedient in practice to treat the disease as one of the contagia.

Symptoms.—Influenza is distinguished from common catarrh by the very marked depression and weakness which attend the early stages. The appetite is impaired, the temperature rises, the pulse gradually increases in frequency, and the depression becomes more pronounced as the disease advances. Swelling of the eyelids and redness of the mucous membrane are also observed, and sometimes the swelling extends to the limbs, or maybe the head. Discharge from the nostrils may, or, as in some cases, may not, be present. Muscular pain and weakness is shown by the feeble gait and the constant change of posture and resting of first one limb and then another.

In other cases the disease appears to be concentrated in the digestive system, affecting the liver chiefly, when the membranes of the eyes and nose become yellow, the fæces hard and coated with a glairy mucus. In other instances the respiratory organs seem to suffer most, and some of the worst cases terminate in a gangrenous pneumonia.

Results.—Influenza is not, under ordinary circumstances, a fatal disease; the mortality has been stated by different authorities to amount to 3, 4, 9, and 10 per cent. In the outbreak which occurred in the States in 1872 the mortality among 30,000 horses was 7 per cent. The average mortality from the disease is stated to be from 1 to 4 per cent.

Treatment.—The great variation in the mortality may be put down to the difference in the surroundings of the sick animal. In ordinary cases authorities allow that medicines are of little value, and careful arrangement of the diet, disinfection and ventilation of stables, and a general attention to sanitary arrangements are sufficient to combat the disease. Avoidance of exposure to climatic changes and absolute rest are essential. The disastrous effect of continuing to keep horses at work after the first indications of the disease are apparent has already been men-

tioned. The main object of treatment should be to uphold the strength and keep fever in check. For this purpose a dose of spirits of nitric ether in combination with aromatic spirits of ammonia, with a little nitrate of potash morning and evening, is usually sufficient.

In cases where serious complications arise, such as pneumonia, bilious fever, &c., skilled veterinary assistance must be employed.

CONTAGIOUS PNEUMONIA OF THE HORSE

The disease which has lately been described as contagious pneumonia is generally included in the term influenza; it is, in fact, that form of the infection in which the central respiratory system is specially implicated.

Causes.—According to Schütz, contagious pneumonia of the horse is due to a specific organism, an ovoid bacterium, one of a very large class of microbes, most of which are stained by aniline colours at both ends, with the central portion transparent and colourless.

Inoculations made with the microbe of contagious pneumonia of the horse produce positive effects in mice, rabbits, pigeons, and guinea-pigs, and injections into the lung structure of the horse produce all the symptoms of contagious pneumonia.

A considerable mortality attends this disease, reaching sometimes as high as 20 per cent. Treatment of this disorder would not, of course, be attempted by an amateur.

GLANDERS AND FARCY

It cannot be said that the horse is particularly subject to diseases which are propagated by contagion, but it is certainly the case that the animal is the victim of one malady which, from its insidious nature and the tenacity with which it clings to the premises in which it breaks out, will bear comparison with any of the plagues which affect the lower animals.

Glanders and farcy, or, more correctly, the one disease glanders, or in technical language equinia, which, according to its manifestation in different parts of the body, is distinguished by one or the other term, has a very wide distribution and a history which is lost in the lapse of time. It was known as far back as available records extend. According to an article which was published in Vol. VI, Part 1 of the *Journal of the Royal Agricultural Society of England*, 1895, the first English writer on agriculture, Fitzherbert, says, in his *Boke of Husbandry*, published by Pynson in 1523, when describing the "deseases and sorance of horses", that "Glaunders is a desease that may be mended, and cometh of a

heate and a sodeyne colde, and appereth at his nosethrylles and betwene his chall (jowl or jaw) bones. Mournynge on the chyne is a desease incurable, and it appereth at his nosethryll lyke oke water. A Glaunder, when it breaketh, is lyke matter. Broken winded and pursiveness is but shorte blowynge. . . . The Fareyon is an yll soraunce and maie well be cured in the begynnynge and wyll appere in dynerse places of his bodye, and there wyll ryse pymples as muche as halfe a walnut-shell, and they will followe a veyne and wyll breake by itself, and as many horses as do playe with him that is sore and gnappe of the matter that runneth out of the sore shall have the same sorance within a moneth after; and therefore keep the sycke from the whole. And if that sorance be not cured betyme he wyll dye of it."

Other writers—Dr. Bracken on the *Art of Farriery*, 1739; Mr. Gibson, 1751; James White, 1802—give their views as to the nature and origin of the disease. Dr. Bracken does not believe that the affection is contagious any more than a cold or consumption is, in which he is probably correct, as both these diseases are undoubtedly contagious, but he guards his expression of opinion against any mistake by asserting that the cause of the disease is atmospheric. It is curious to note that the same authority considers the discharge from the ulcers of farcy may be contagious. Mr. Gibson looks upon glanders as the most infectious of all maladies that attack the horse. James White also considers glanders a contagious disease, but he believes also that it may arise spontaneously, adding, however, that the most common cause of farcy is contagion from a glandered or farcied horse. That he considered the diseases to be identical is apparent from his remark that they will reciprocally produce each other.

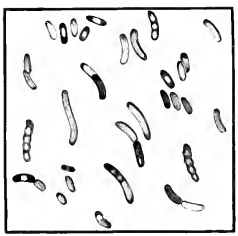
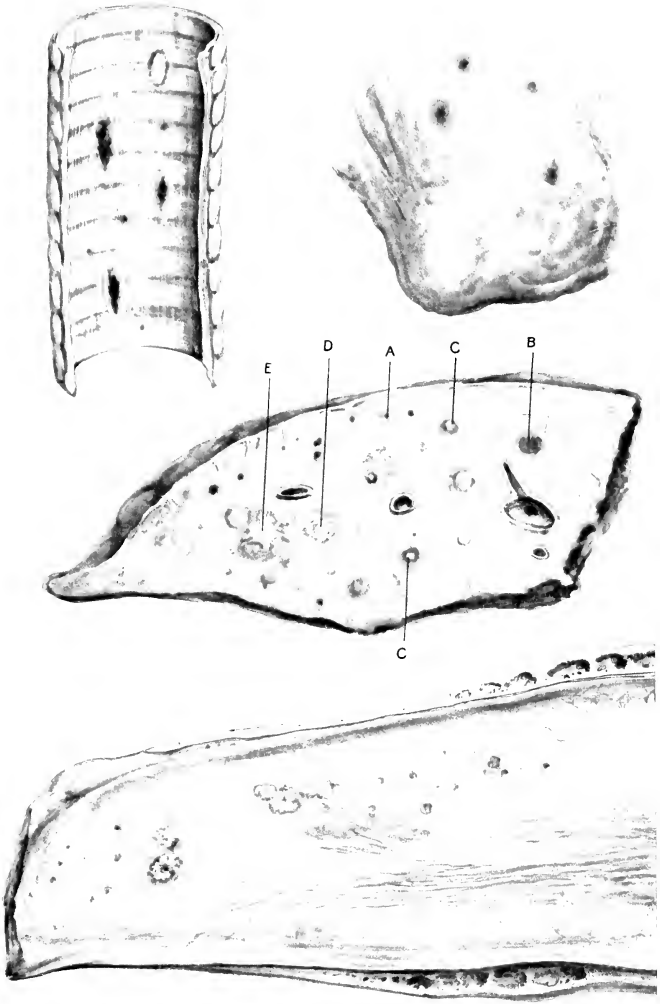


Fig. 213.—Bacillus mallei

Causes.—Not many years ago numerous causes were quoted as being directly or indirectly concerned in the production of glanders, as, for instance, the debility arising from attacks of acute diseases, insufficient or bad quality of diet, and generally exposure to insanitary conditions. Since the discovery, however, of the infecting organism of glanders by Schütz and Löffler in 1882, which is known as the *Bacillus mallei* (fig. 213), only one cause can be referred to, *i.e.* the transmission of the infecting germ derived from a diseased animal. That the bacillus of glanders is the real cause of the disease was proved by Schütz, who cultivated the organism



GLANDERS

on boiled potato, also on the sterilized serum of the horse and sheep, and produced glanders in horses and other animals by inoculation with the pure cultures.

Infection of Glanders.—Communication of glanders from one horse to another with which it may be in contact is a fact which is hardly questioned in the present day, but it is also true that in many cases a glandered horse has been kept in a stable with a number of others without any extension of the disease so far as an ordinary clinical examination would enable an observer to determine. This circumstance has been noted by some of the older writers. On the other hand, recent investigations prove that the period of incubation, by which term is meant the period which elapses between the introduction of the virus and the declaration of the disease, is exceedingly variable, although it has been stated by different writers that it may extend from a few days to a year.

Incubation.—Experiments go to prove that an inoculated ass, an animal which is very susceptible to glanders, will be visibly affected in the course of six or seven days. It is, of course, almost impossible to determine the exact date of infection under ordinary circumstances, and there is also to be taken into account the question of susceptibility; but altogether the evidence which has been obtained by very careful enquiry leads to the conclusion that when the infective material is introduced into a horse's system through the breathing organs, or an open wound in any part of the body, the disease in some stage will be developed in the course of a few days. It may, however, remain in an absolutely dormant condition for months or years, and during this time, although the animal is to all intents and purposes a glandered horse, there may not be any external evidence whatever of the existence of the disease. It is consequently easy to understand authorities having expressed various opinions in reference to the incubative period.

Symptoms of Glanders.—Since the introduction of the *mallein* test it is not of so much importance as it formerly was to estimate the value of certain indications which were once looked upon as sufficient to render an animal suspected. The distinctive symptoms of the worst stage of glanders are not easily mistaken; in fact, they are quite familiar to most persons who have been in any way concerned with the management of horses. Ulceration of the lining membrane of the nostrils, with an adhesive discharge at first of semi-transparent character and later of a purulent nature, with swelling of the glands under the jaw, are among the most characteristic symptoms. The local disease of the nasal membrane is commonly confined to one side, so far at least as clinical examination can determine, and the enlarged glands are always on the side corresponding to the

diseased nostril. In the chronic form of glanders the discharge from the nostril is sometimes so slight as to attract very little attention, and no ulcers can be seen on any part of the nasal membrane, which, however, is frequently pallid or of a bluish discoloration. Even these symptoms are, however, absent in many cases in which a post-mortem examination will prove the animal to be affected with glanders.

When glanders presents itself in the form of farcy, the real difference in the symptoms results from the presence of the local disease in the skin, chiefly that of the hind extremities. The nodules and subsequent ulceration in the mucous membrane, which are characteristic of glanders, are accepted as indications of farcy when they appear in the skin. In both forms of the disease there is the same affection of the lymphatic vessels and their associated glands, and the distinctive nodules of glanders which are found in the lungs are also seen in cases of farcy.

Accompanying the eruption of the so-called farcy buds in the skin of the extremities there is usually a tumefaction of the lymphatic vessels and general enlargement of the affected limb. Indeed, the first symptom of the disease is commonly a certain degree of stiffness of movement, which becomes more marked as the swelling increases. Farcy, when treated as a separate disease, was considered to be less serious and more amenable to treatment than glanders. In many instances animals apparently recovered under a course of tonic medicine with liberal rations, but it was allowed that such recovered animals often exhibited distinctive symptoms of glanders after an attack of any acute disease, as influenza or pneumonia.

The symptoms of farcy are so definite that any experienced stableman would consider himself competent to decide whether or not the disease existed in any horse under his charge, but recent investigations by Algerian veterinary surgeons, and also by Professor Nocard, indicate that it is extremely likely for the most marked symptoms to lead to a wrong diagnosis, as there exists in horses a form of inflammation of the lymphatics—which was first noticed by the veterinary surgeons of the Algerian army, and described by them as suppurating lymphangitis—which presents the chief symptoms of farcy, *i.e.* swelling of the limb, enlargement of the lymph vessels, formation of small tumours (farcy buds) which burst and subsequently undergo ulceration.

How extremely close the resemblance between the two diseases—*epizootic lymphangitis* and farcy—is may be judged from Professor Nocard's remarks in reference to fifty-nine cases of apparent farcy—forty-three only were really the subjects of the true disease (glanders); the other sixteen were affected with suppurating lymphangitis. The two affections may be distinguished by microscopic examination of the matter discharged from

the pustules in the skin. In *epizootic lymphangitis* will be observed a number of small, highly refractile lemon-shaped bodies, some free and others contained in the pus corpuscles. These are the cryptococci by which the disease is caused. Glanders, on the other hand, will be recognized by the *mallein* test, and, in addition, the inoculation of guinea-pigs and the cultivation of the organism on different media, as potato, bouillon, agar-agar, and serum-gelatine. Such complicated tests are, of course, not likely to be applied excepting in cases where a valuable horse is condemned as suffering from farcy, and the symptoms are limited to the lymphatics of the extremities.

Precautions to be taken to prevent the spreading of Glanders.—It is now perfectly well known that glanders is communicable to the human subject, and by inoculation to guinea-pigs, sheep, and goats. Cattle only suffer local disease, rabbits are very slightly susceptible. Among the carnivora, lions and other animals of the same class, kept in menageries and fed on raw flesh of horses, incur the risk of getting glanderous matter in this way introduced into their systems. Several cases of extensive ulceration of the skin of the paws, followed by the death of the animals, have occurred among lions in different parts of the country. It is satisfactory, however, to note that the infective matter of glanders does not retain its activity for a very long time; exposure to dry air kills it in fifteen to twenty days; but so long as a horse is affected with the disease in any form, a constant supply of the virus is kept up, and susceptible animals, as well as men attending upon the diseased horse, incur a certain amount of risk. Suspected animals, therefore, should be kept in a secure place until the nature of the disease is determined. The injection of *mallein* will at once resolve any doubt which may exist, and if the suspected horse exhibits the characteristic reaction—that is, rise of temperature to 103°, 104°, or 105°, with signs of systematic disturbance, dulness and loss of appetite, and a swelling at the seat of inoculation—it is tolerably certain that the suspected horse is suffering from glanders, and it should be destroyed without delay.

Glanders is the only contagious disease of the horse which is dealt with by any general order under the Diseases of Animals Act, 1894.

The Glanders and Farcy Order of 1894 gives extensive powers to local authorities with regard to public warning of the existence of the disease; the movement of diseased or suspected horses, asses, or mules; cleansing and disinfection; and also for slaughter of diseased horses and the payment of compensation. The first duty of the owner of a diseased horse is to give notice of the fact of the existence of the disease to a police constable in his district, which notice will be communicated to the local authority and to

the Board of Agriculture in order that the necessary measures may be adopted.

Use of Mallein in the Detection of Glanders.—Before the discovery of *mallein*, a few years ago, the only test which could be applied in doubtful cases was the inoculation of an ass with the nasal discharge. Later on, guinea-pigs were found to answer the purpose even better, and Dr. Woodhead employed a double test by inoculating the most susceptible

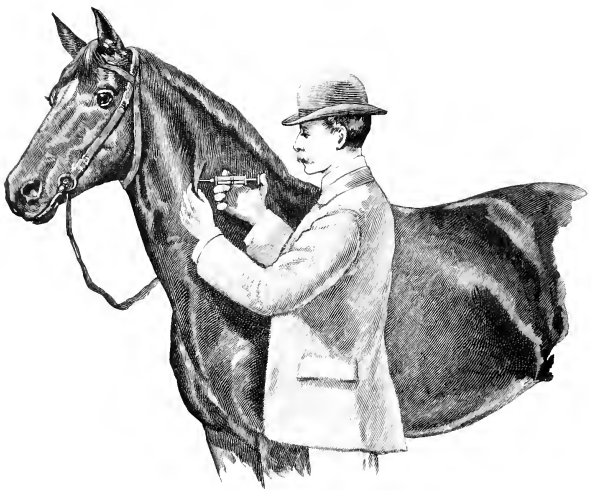


Fig. 214.—Inoculating with Mallein

animal, a guinea-pig, and at the same time a comparatively unsusceptible one, a rabbit.

If the guinea-pig died after exhibiting distinct symptoms of glanders, and the rabbit recovered after showing slight signs of fever, as a rise of temperature with local irritation, or slight ulceration, it was concluded that the horse was affected with glanders.

The use of *mallein*, however, is a much more delicate test, because it is equally effective when applied to horses which are not suspected, or at least exhibit no sign of disease of any kind, but are known to have been in the same stable with a glandered horse. *Mallein* is prepared by cultivating

the *bacillus* of glanders in bouillon, to which 5 per cent of glycerine has been added. The vessels containing the cultivation are kept from three to six weeks at a temperature of 100° Fahr. The cultures are then sterilized by steam, and afterwards filtered through unglazed earthenware to separate the dead bacilli. A clear sherry-coloured liquid is obtained, perfectly free from organisms.

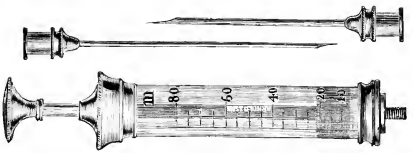


Fig 215. Mallein Syringe

It has been proved by numerous experiments in this country and on the Continent that the injection (fig. 214) of the fluid *mallein* under the skin of the neck of a horse produces characteristic reaction, even in cases in which after death only a single glanderous nodule has been found in the lungs. The test has been also applied to healthy horses and to horses affected with bronchial catarrh, pleurisy, strangles, and nasal gleet, but in no instance has the complete characteristic reaction been observed. It may, therefore, be considered that the *mallein* test is perfectly reliable, even in cases in which the disease was in the early stage.

STRANGLES OF THE HORSE

Strangles, or pyrogenic fever, or external scrofula, are names given to this catarrhal disease, which is so very common among young horses. On the question of the infectious nature of the disorder opinions differ very materially. Dr. Twill, in his recent work on the pathology of the domestic animals, describes strangles as an acute infectious disease. Robertson defines it as a specific febrile disease of the horse probably under certain conditions contagious. Williams states in definite terms his opinion that the disease is not contagious, but he admits, nevertheless, that it is better to take precautions against its diffusion by separating the diseased horse from healthy ones.

In the popular view the disease is the result of some peculiar condition of the system, which leads to the external manifestations characteristic of strangles, in the course of which the morbid matter is discharged from the system, and the animal is supposed to be so much the better for its removal.

In favour of the contagion theory there are the facts derived from experimental enquiry commenced a hundred years back. In these investi-

gations strangles was directly transmitted by inoculation with the nasal discharge. Similar experiments have been performed by other investigators with negative results. Schütz, however, discovered an organism some years ago, a streptococcus, with pure cultivation of which he succeeded in causing the disease in healthy colts, and from the whole of the evidence it will be decidedly safe to accept the view that strangles is a contagious disease of the horse.

Strangles only occurs in the equine race, including the horse, ass, and mule. It is common to young horses from two to five years, and occasionally it occurs in colts of a few weeks old; also it may appear in very old horses, in which case it is commonly spoken of as bastard strangles, and invariably runs a mild course.

Fig. 216.—Steaming for Strangles

Symptoms.—It is generally admitted that the earliest symptoms of strangles are those of a mild catarrh, slight fever, increase of pulsation and discharge from the nostrils, cough and sore throat, followed by a diffuse swelling of the glands and cellular tissue under the jaw. One of the difficulties in dealing with the disease as a contagious malady arises from the absence of any special symptoms, rendering accurate diagnosis in the early stage impossible. Practically the question is only one of importance when immediate diagnosis is essential, as in the case of the admission of an animal to a show-yard. This difficulty, however, is lessened by the fact that all catarrhal affections may prove to be more or less contagious, and ordinary benign strangles is probably not more infectious than an ordinary cold in the head.

In a few hours, or at most in a day or two, more characteristic symptoms of strangles may be looked for. The nasal discharge becomes purulent. A swelling under the throat, the beginning of an abscess, will be apparent, and during the formation of pus, fever is more acute. The animal's appetite is now impaired, the temperature rises considerably, and the pulse becomes much more frequent. When the suppuration is complete, and the abscess beneath the jaw has been emptied, the febrile symptoms gradually disappear.

Treatment.—Good nursing appears to be all that is really necessary in dealing with strangles of the ordinary type; fumigations to the throat

(fig. 216) and poultices (fig. 217) are commonly employed for the purpose of assisting the suppurative process. When mature, the abscess should be opened, and the matter discharged collected in a basket on saw-dust and burned. The pus cavity should be well syringed out with a 5-per-cent solution of carbolic acid, and afterwards filled with cotton-wool which has been previously wrung out in the same solution. The plug of wool should be changed every day, and the part kept thoroughly clean. Soft diet and warm clothing, with thorough ventilation of stables, constitute the additional treatment which is required.

Fig. 217.—Poulticing for Strangles

Strangles sometimes assumes a chronic, and occasionally a malignant, form, ending in the introduction of pus into the circulation (pyæmia) or the extension of the suppurative process to the glandular system; sometimes also blood-poisoning (septicæmia) occurs when the exudation products become putrid. Cases of the more malignant forms of the disease do not come within the scope of domestic treatment, but require skilled professional aid.

ANTHRAX OF THE HORSE

The disease which is recognized as true anthrax is due to the existence in the body of a specific organism, the *Bacillus anthracis* (fig. 218), a motionless rod which is found in the blood and in all the tissues of the body into which blood can penetrate. The organism belongs to the class of aerobic bacteria, that is, living only in air. Without the presence of oxygen the anthrax bacillus very quickly dies. Anthrax bacilli are readily cultivated in bouillon or gelatine. In the animal body the organism multiplies by the formation of spores, and the almost invariable fatality which results from the introduction of the microbe is due to the formation of a poison during the development of the organism. Anthrax is much more prevalent among cattle and sheep than among horses, and when the latter are infected it is usually in consequence of a previous outbreak of the disease among other stock on the farm. Cases which have occurred recently, however, leave no doubt that the horse may be infected with

the disease in its own stable, through the agency of contaminated provender, hay, or oats; the latter particularly have been proved in several instances to be highly infective to the horses which consume them.

Symptoms.—Anthrax in all animals runs its course to a fatal termination with remarkable rapidity, and there is often nothing in the indications to excite suspicion of the nature of the disease. There are the ordinary signs of fever, rise of internal temperature, quick pulse, and increased respiration. The animals stagger when attempting to walk, and sometimes suffer from colic. The most characteristic symptom is swelling of the throat, extending downwards towards the chest; finally there is profuse perspiration, which is followed by death usually within thirty hours from the time of the attack. In most cases a fatal result is the first indication of the existence of the disease. An animal which has been left in apparent health is found dead an hour or two afterwards.

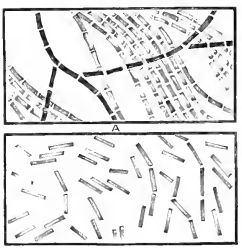


Fig. 218.—Bacillus anthracis

A, Bacilli in chains. B, Bacilli disconnected.

The post-mortem appearance indicates general congestion of the internal organs, with effusion of blood into the tissues and cavities of the body and also under the skin.

Treatment.—Owing to the rapid progress of the disease, curative treatment is never attempted in cases which are diagnosed as anthrax, but it may be remarked that the diagnosis is extremely difficult, even when the disease is suspected to be anthrax, from the fact that the organism is not detectable in the blood until shortly before death, and it is only found in abundance after death, as seen in fig. 218, B.

Prevention will include an enquiry into the circumstances which have led to the introduction of the disease, and with this view it will be necessary to examine the articles of food by the aid of the microscope, and also by use of cultivative media on which the organism is known to grow. The final test of the inoculation of guinea-pigs or rabbits with the water in which the suspected provender has been soaked will probably be necessary.

In cases of the outbreak of anthrax among horses kept in stables it will be safe to conclude that the organism had been introduced into the blood by contaminated provender, water, or litter, but when horses are attacked while on a pasture it is very likely that an enquiry will prove that the

HORSE-POX, TUBERCULOSIS, AND ENDOCARDITIS

1. Normal Horse-pox pustule. 2. Natural Horse-pox pustule. Additional Stomatitis. 3. Tuberculous Nodule in Lung. 4. Tuberculous Lung. AA, cavities formed by the breaking down of tubercular nodules. BB, tubercular nodules in the early stage of development. C, Pleura. 5. Ulcerative Endocarditis of the Aortic valves.

ground has been contaminated with the infective material conveyed in refuse from manufactories, or from a previous outbreak of the disease among cattle or sheep. In any case the immediate removal of horses from the place where the disease originated is an obvious precaution which should be at once adopted.

Anthrax is easily communicated to man by accidental inoculation during post-mortem examination or while cutting up carcasses of animals dead of the disease. It is on this account particularly desirable to note that for the purpose of diagnosis a portion of the ear may be cut off and the blood which flows from the cut surface may be used for microscopic examination, cultivation of the organism on artificial media, or for test inoculation, without any serious risk to the operator.

Carcasses of animals which have died of anthrax should be burned or buried unent and covered with quick-lime. The anthrax bacillus, when cut off in this way from contact with air, very quickly becomes inert.

HORSE-POX

Veterinarians in this country do not generally recognize the existence of small-pox in the horse. The disease is described by Continental authorities as an eruption on the pasterns, the posterior surface of the joints being chiefly affected. The skin becomes swollen and red, the inflammation extends some distance up the limb, vesicles, or small blisters, followed by pustules, appear and discharge a viscid fluid. A similar eruption appears sometimes in the nose and lips, and also on the mucous membrane of the mouth and nostrils. The disease is admitted to be very rare in this country, and when it does occur it is most probable that it would be mistaken for the disease of the pastern which is known as "grease". Horse-pox is a benign affection, terminating in recovery without treatment in a few weeks.

Experimental and accidental inoculations are said to produce in man an eruption similar to that following the introduction of the vaccine virus, and it is asserted that the disease so conveyed protects the individual from small-pox.

GLOSS-ANTHRAX

This is a form of anthrax in which the disease specially involves the tongue, and, in a less degree, the tissues of the throat. It is not, however, to be confounded with septic glossitis, a malady in which the tongue becomes considerably enlarged, as the result of excoriation and local poisoning by inoculation with septic organic matter.

Gloss-anthrax is sudden in its onset, and rapid in its course, proving fatal in twenty-four to forty-eight hours. It is specially marked by an enlargement of the entire length of the tongue, during which large vesicles or blisters appear on some part of its surface, and occasionally on the cheeks also. Within them is contained a quantity of red and blackish-red watery exudation, but this soon escapes, leaving behind grayish-black unhealthy-looking sores. The tongue is swollen, and partly protrudes from the mouth, at first presenting a red appearance, but soon becoming dark and livid. The enlargement is also observed between the jaws, extending to the throat, and sometimes along the course of the neck. The tumefied state of the tongue renders mastication and swallowing impossible, and considerably embarrasses the breathing. The face in this condition presents a hideous, and at the same time an anxious, expression. The lining membranes of the eyes and nose are intensely reddened, the pulse is rapid, small, and weak, the temperature of the body increased, and a fatal prostration, speedily associated with twitching and trembling of the muscles and patchy sweats, supervenes.

Treatment is of no avail in these cases, and they should be summarily disposed of. As a means of preventing further spread of the disease every sanitary precaution should be taken as regards the horse, the stable, and the litter removed out of it.

RABIES OF THE HORSE

It is well known that the bite of a rabid animal is the sole cause of this disease in the horse.

In this country it is always traced to the bite of a rabid dog. The time which elapses between the inoculation of the animal by the teeth of a dog and the appearance of the disease varies from four to twelve weeks, and cases are recorded in which it is extended to a much longer period.

Symptoms.—If it is known that the horse has been bitten by a rabid dog, the attendant will carefully watch for the first symptoms of derangement. Otherwise, no suspicion being excited, very little attention will be paid to the early symptoms. The horse becomes nervous and excitable, bites at any object within his reach, and occasionally seems disposed to attack the persons to whom he is quite accustomed. In some cases the horse will bite his own skin, and will very likely swallow indigestible substances, anything which is lying on the ground. There is always considerable thirst, and those who look for any indications of hydrophobia, dread of water, will be disappointed, as that symptom is peculiar to the human subject. As the disease becomes more pronounced the horse

becomes violently excited, and is affected with spasms of the neck and legs. When a stick is held out the horse will seize it, and may make a feint to attack the person holding it, but, instead of succeeding, the muscular spasm becomes so violent that the horse generally falls, and after a while rises again in an apparently tranquil state. Death usually occurs in less than a week, but, as a matter of common precaution, the horse will be killed as soon as the nature of the disease is ascertained.

TETANUS OF THE HORSE

Tetanus occupies a somewhat dubious position in the classification of diseases. Formerly it was looked upon as a tonic spasm of the voluntary muscles, resulting from irritation affecting the nerves from an unhealthy wound. The affection was divided into traumatic tetanus, when it was traced to an injury or wound, and idiopathic, when it occurred independently of any external wound.

It is somewhat remarkable that the older writers insist very strongly upon the influence of various common causes in the production of this disease. Thus Delatere Blaine, writing in the early part of the present century, refers to tetanus or locked-jaw as a morbid irritation of part or the whole of the nervous system, originating in the brain itself, or ultimately reaching it, according as it is idiopathic or symptomatic. Idiopathic tetanus, he remarks, is most frequent in the horse, and its causes are, some of them, evident, others, occult.

In the list of ordinary causes to which he attributes the disease is cold, especially when the body is heated, as in the case of a plunge into a river during a hunting run, or a horse standing still during a check after a severe burst, or the constant dripping of water on to the body from a defective roof of a stable; also the presence of worms in the alimentary canal, especially botts in the stomach. Traumatic or symptomatic tetanus he traces to various external injuries, contusions, lacerations, and wounds made in surgical operations. Wounds of tendinous and ligamentous parts have always been considered to be particularly dangerous.

Even twenty years ago tetanus is described as a disease, the general pathology of which is very little known, and writers referred it to an exalted polarity of the nerve-centres, or to a bad condition of the blood, or the effects of cold acting on the sensitive nerves.

The views above stated, with certain modifications, obtained until Nicolaier, in 1884, discovered that inoculation of mice, rabbits, and guinea-pigs with portions of soils, obtained from streets and from fields, produced symptoms which were considered to be tetanic in their character. In

the abscess which was formed at the point of inoculation several microorganisms were found, and one of them produced similar tetanic symptoms when inoculated into other animals.

Some considerable time elapsed before what is now known as the tetanus bacillus was obtained in the state of pure cultivation, owing to the fact that the microbe was anaerobic, and consequently would not grow in the air. Pure oxygen, it is said, destroys it completely. The bacillus occurs in the form of small motile rods with the spore at one end, giving to the organism the appearance of a minute drum-stick, and it grows readily on the usual media when kept in an atmosphere of hydrogen. Dr. Sims Woodhead, in his work on *Bacteria and their Product*, remarks, in reference to the universal distribution of the bacillus, that M. Bossano obtained soil from forty-three different regions in various parts of the globe, and produced tetanus in white mice and guinea-pigs with twenty-seven out of the forty-three specimens, and from his experiment Bossano concluded that soils which contain much organic matter almost invariably contain tetanus bacilli.

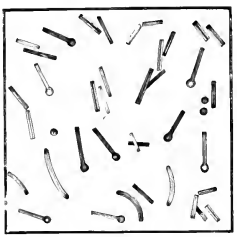


Fig. 219.—Bacillus tetani

The information which has been obtained of late years proves that tetanus is one of the pure contagia, and is due to the introduction of the specific microbe into the animal system through a wound in some part of the exterior of the body. Whether or not it is possible that the disease may arise from the introduction of contaminated soil into a wound in any part of the alimentary canal it is impossible to determine. There do not, however, appear to be any facts which would militate against this assumption, and infection occurring in this way—that is, through the agency of a wound in the interior of the body—would naturally give rise to the idea that the disease was idiopathic in its origin. There can be no doubt, however, that the majority of cases are due to the infliction of a wound on the exterior of the body, especially in such a position that the injured part is likely to come frequently in contact with the earth.

It appears that on entering the wound the bacillus of tetanus locates itself in the damaged tissues, and is not distributed throughout the body The poison, however, which it produces in the wound during its growth will be readily absorbed and carried to the nerve centres, inducing the irritation which results in the tetanic spasm of the muscles.

Tetanus does not spread from one horse to another by contagion or infection, but it can be transmitted by inoculation with the pus, or by a portion of the damaged structure of a wound, and there is a certain amount of risk incurred by the persons who dress such wounds if they happen to have any abrasions of the skin of the hands.

It is usual to classify the disease according to the part of the body which is most affected, and in accordance also with the rapidity of its progress. Thus there is acute and chronic tetanus. The terms which are sometimes in use—rheumatismal tetanus as the result of cold, and toxic

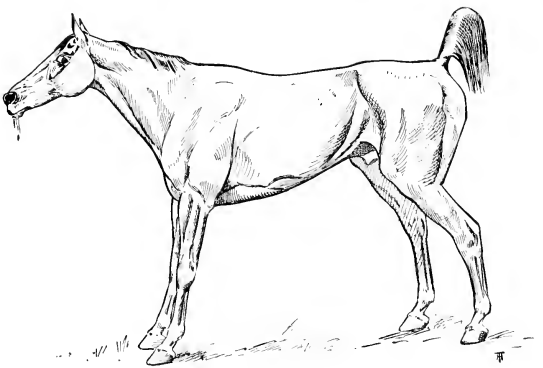


Fig. 220.—Tetanus

tetanus due to poisoning by strychnine—do not properly come under consideration in connection with the true contagious disease. When the tetanic spasm affects the muscles of the head and neck the condition is described as trismus. When the spasm affects the muscles of the back, and pulls the head backwards, the term opisthotonos is applied; in the opposite condition the word emprosthotonos was used to indicate the bending of the body forward, and in cases where the spasm affected one side of the body, causing it to curve to that side, the condition was defined as pleurosthotonos. All these states are recognized in different phases of the disease in the human subject, but they are rarely met with in the horse, with the single exception of the first, described as trismus, which is the most common form.

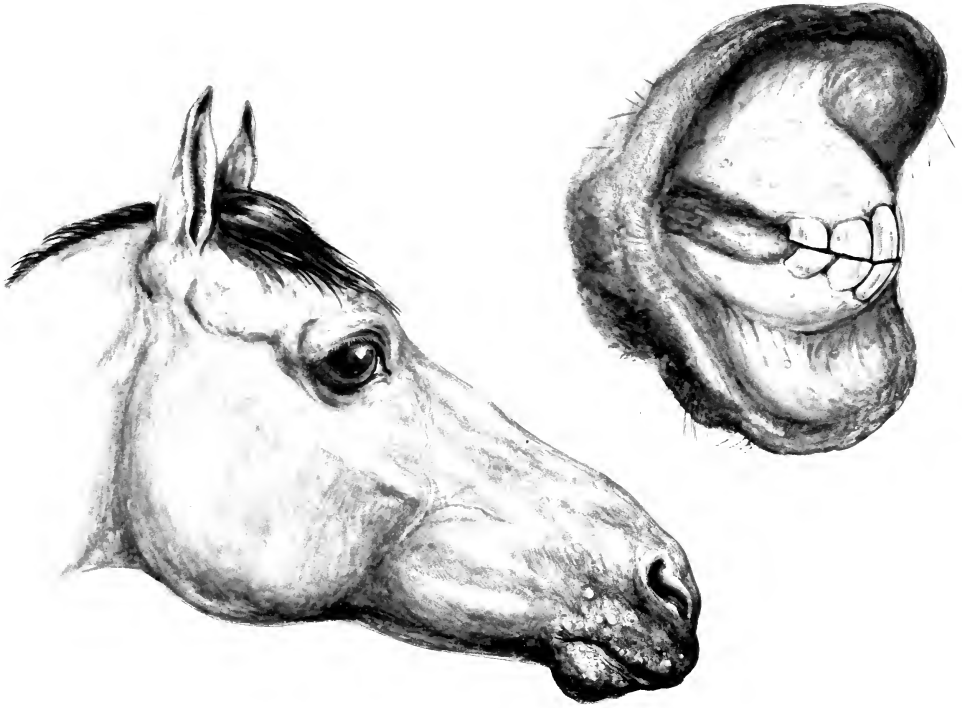
Symptoms of Tetanus.—At the commencement of the disease, from ten to sixteen days after the introduction of the infectious material, some

stiffness in the muscles of the head and neck may be observed. The animal exhibits some difficulty in grasping its food, and in most cases the muscular spasm rapidly increases, and the animal is incapable of moving the head and neck. The jaws are locked or brought forcibly together, the tail is elevated, and the legs are stiff and abducted. In this condition any sudden alarm produces an accession of the spasm, and in the horse a characteristic symptom is the sudden retraction of the eye into its orbit, and the thrusting forward over it of the nictitans membrane (haw). In the acute form of tetanus the spasm is perceived to extend rapidly along the muscles of the back, loin, and tail, and to the muscles of the extremities, which are commonly spread out, and are only moved with difficulty. The respiration is always laboured in consequence of the affection of the respiratory muscles, and the nostrils are widely dilated. The surface of the body is commonly covered with perspiration. The duration of the disease varies, according to the acuteness of the attack, from three or four days to several weeks, but the majority of fatal cases terminate within a week. In cases which recover, the muscular stiffness may continue for several weeks, gradually becoming less until it entirely ceases. Generally it may be said that should the animal survive the ninth day recovery is rendered probable.

Chronic Tetanus is indicated by a less defined spasm, which commonly remains limited to the head and neck; in many cases the animal retains a certain power over the muscles of mastication and can take soft food.

Post-Mortem Appearances.—There are no very important changes recognized in the nerve centres or in the nerve fibres beyond slight congestion, which sometimes is apparent in the nerves proceeding from the wound. The blood is dark in colour, and there are patches of blood-coloured exudation under the serous and mucous membranes. The lungs are usually congested, sometimes in a state of gangrene. Commonly the muscles are very dark in colour, and are marked with patches of blood-coloured exudation here and there.

Treatment.—Absolute quietude experience has proved to be essential. The late Professor Spooner used to advise his students to lock the stable door and take possession of the key, and this cannot be regarded otherwise than as excellent advice. Where an animal offers no resistance it is desirable that he should be slung to prevent the injury which results from his struggling to maintain the erect position. When the patient can masticate, any kind of green food or cooked food may be given, otherwise the diet will have to be restricted to gruel, or meat soup thickened with meal, and at all times cold water should be within the animal's reach. The surface of



STOMATITIS PUSTULOSUM

the body should be protected from cold by clothing adapted to the season. Medicines appear to be of little use. When they are employed, narcotics should be selected, and exhibited by the method of hypodermic injection.

The injection of large quantities of antitoxic serum has been tried recently, but with very moderate success, and under most favourable circumstances tetanus must be looked upon as an extremely fatal disorder.

STOMATITIS PUSTULOSA CONTAGIOSA

This is a specific contagious disease of a febrile character, in which an eruption appears in the mouth and on the lips, and sometimes on the skin of the face, rarely on other parts of the body. It is communicable from horse to horse, either by inoculation or by contact of the virus with the mucous membrane of the mouth. It has a period of incubation from one to three days, and runs its course in from ten to twelve days.

Foals and young horses are most susceptible to infection, and old ones least so.

The spread of infection usually takes place by means of food and water, and by the use of infected mangers, troughs, pails, and other stable utensils.

It is seldom fatal, but on gaining access to a stable of young horses it spreads rapidly through them unless prompt measures of precaution are taken for its suppression.

One attack of the disease is protective against another for some time, but for what period is not known.

Symptoms.—Save in exceptional cases there is not much constitutional disturbance. A slight rise of temperature, a little increase in the number of pulsations, are the only signs of general disorder.

Twenty-four to forty-eight hours after infection, soreness of the mouth is evinced by the discharge of sticky saliva in the act of feeding, and more or less difficulty of mastication. The mucous membrane of the mouth is at this time of a bright red colour, and here and there small pimples are seen on the inner surface of the lips, or beneath the tongue or the gums, or maybe on the skin of the lips, or on all these parts in succession. Each pimple becomes charged with matter, and is quickly resolved into a round superficial ulcer with a sharp thin edge, and showing little or no tendency to spread. The eruption may be considerable and closely packed, or it may consist only of a few scattered sores. In some instances the gland beneath the jaw (submaxillary lymphatic gland) is enlarged, and the eruption may appear in the nostrils, giving rise to a discharge, when the disease is sometimes mistaken for glanders.

With the soreness of the mouth there may or may not be difficulty of swallowing. About the sixth day the sores begin to heal, while others of more recent eruption will still be in the nodular form or in the early stage of ulceration.

The features which distinguish this disease from glanders, with which it may be confounded, are: (1) the short period of incubation; (2) the rapidity of its spread; (3) the superficial, sharply-defined, thin-edged ulcer; (4) the great rapidity with which the sores heal; (5) the absence of any inflammation of the lymphatic vessels; (6) the sudden onset and the short duration of the nasal discharge.

Treatment.—The disease usually runs a benign course, and requires but little interference on the part of the attendant. The mouth may be washed out two or three times a day with a solution of chlorate of potash, or a weak solution of alum, but beyond this no local applications are needed. General treatment will not go beyond the administration of a little nitrate of potash in the food once a day.

The diet should consist of bran, boiled roots, and scalded chaff, over which a little common salt may be sprinkled.

Measures of Prevention.—In this connection it must be remembered that the chief source of the virus is the saliva.

When the disease makes its appearance, the sick should be promptly removed from the healthy, the bedding should be burned, the mangers and fittings, baskets and buckets, &c., well scoured with a strong solution of soda, and freely disinfected. The floor of the stable should be scraped, well brushed out, and dressed with carbolic solution, or well covered with lime.

TUBERCULOSIS OF THE HORSE

It was for a long time believed that the horse was refractory to the invasion of tubercle, and the impression still remains that the disease is extremely rare in this animal. Recent enquiries, however, tend to prove that this view is erroneous. The improved methods of investigation which have lately been introduced have enabled the pathologist to demonstrate the existence of the tubercle bacillus in various organs—lungs, liver, &c.—in diseases which were formerly described by other names, as caseous degeneration, lymphadenoma, and induration, or scirrhus. The detection of the tubercle bacillus in morbid deposits in the glands and other structures is, of course, conclusive, and it may also be said that it is essential for correct diagnosis.

Koch's discovery of the tubercle bacillus (fig. 221) established a new era in the history of consumption and other forms of tuberculous disease.

It is now admitted that all these affections may properly be classed among the true contagia, depending as they do on the introduction of a specific organism from without.

Experimental evidence leaves no room for doubt that the affection occurs by introduction of the germs into the respiratory organs along with inhaled air, and also into the digestive organs with the food.

In the horse, as in most animals, the lungs are more often affected than other organs, and it may be assumed that the most frequent mode of infection is through the respiratory passages. The animal, however, is not exempt from the other mode of infection.

Inoculation with tuberculous matter causes, in most cases, tuberculosis by the introduction of the virus into the blood.

Fig. 221.—Bacillus of Tuberculosis

Symptoms.—Even in cases where signs of disease are present there is nothing to be discovered which is positively indicative of tuberculous deposit—cough, difficulty of breathing under exertion, irregular appetite, and emaciation are all signs of tuberculosis, but these may all be due to other affections, and it is not until an opportunity for microscopic examination of expectorated matter or a post-mortem examination occurs that the existence of the tubercle is as a rule discovered.

Morbid Appearances.—The structural changes which are met with depend very much upon the organ which is affected. In the lungs there are sometimes found miliary tubercles, while in other cases masses of deposit an inch or more in diameter are met with. These larger masses contain a quantity of soft yellow material in the centre. The bronchial lymphatic glands, and also the glands in other parts of the body, are sometimes enormously enlarged, and present yellow softened masses in their interior, and occasionally patches of calcareous or earthy deposit.

Masses of tuberculous matter are occasionally found in the liver, spleen, and kidneys—more rarely in the intestines.

On the lining membranes of the chest and belly isolated tuberculous patches are met with, but the grapy form, as it is called, which is so common in cattle, is not often seen in the horse. Cases of tuberculous deposit in the bones have been recorded, and are probably more common than is generally supposed, the fact being that cases of disease of the bones in the horse are commonly classed under the head of caries or necrosis, and

the diseased structures are not submitted to any critical examination for the detection of the tubercle bacilli.

In the event of tubercle being detected, on post-mortem examination of one horse of a number kept in the same stable, the tuberculin test might be applied experimentally.

DOURINE (MALADIE DU COIT)

This is a specific contagious disease which, like rabies, is communicated only by contact of the virus with an abraded or broken surface. Whether occurring in the male or female horse, it primarily affects the external organs of reproduction, viz. the penis in the male and the vaginal passage in the female. (See Plate XXXV.)

In consequence of this, and the frequency with which it is transmitted from one to the other during the act of copulation, it has been distinguished as "Maladie du Coit", or Covering Disease. Some distinguished veterinary authorities in France and elsewhere have regarded it as identical with syphilis of man, but there is no real evidence upon which to base such a conclusion. It must be admitted that there are in both certain common features, as there are in other specific affections, but the points of divergence are too many and too decided to allow us to assent to the doctrine of unity, for which Bouley, Trasbot, and some other Continental pathologists are responsible. For the same reasons we dissent from the view that it is identical with glanders.

Dourine has appeared as an epizootic in Russia, France, Austria, Switzerland, and other parts of the Continent from time to time during the past century, with disastrous results to the breeding-stock of those countries, but we are not aware of its having occurred in any part of Great Britain.

Origin.—The cause of this disease is the entrance into the blood of a species of protozoa—the *Trypanosoma equipedum*. This is a unicellular organism having a flagellum by which it is capable of considerable activity. So far as at present known it is the only trypanosoma which is not transmitted by a biting insect. The common mode of access of the virus is through the medium of the external genital organs during the act of copulation. The spread of the malady is effected more especially by stallions when going from mare to mare during the breeding season.

It has been induced experimentally, by Nocard, with matter from a diseased centre in the spinal cord, and previously, by Herting, with discharges from the vaginal mucous membrane.

Symptoms.—The period of incubation is said to extend from eight to twenty-eight days. At the expiration of the term a discharge issues

from the penis of the male or the vulva of the female, after which small red spots appear on the glans or vulva, and on these arise vesicles or blisters, which break, leaving a small spreading sore or ulcer. As the disease progresses the enlargement spreads from the penis to the sheath, and maybe to the scrotum and testicles. In those instances where the disease first attacks the urethral canal a muco-purulent discharge issues from the end of the penis, and urine is discharged with some difficulty.

A similar eruption appears on the vaginal mucous membrane of the mare, associated with more or less considerable swelling of the labia, and an ichorous discharge. If the eruption is severe the irritation may extend to the mammary gland and induce the formation of abscesses upon or in it.

Both stallions and mares exhibit marked sexual excitement in the course of the early stages of the disease, the former by frequent erections of the penis, and the latter by exhibiting signs of œstrum. The local manifestations may subside, or altogether disappear, after a time varying from several weeks to months, but this is not to be taken as an indication of the termination of the disease, for it is at this time that the general health begins to give way to the ravages of the virus. There is now dulness and progressive weakness, shown by shifting the weight first from one leg and then the other. An eruption of the character of urticaria, but usually more enduring, appears about the neck, or the chest and shoulders, or the croup, or on all of these parts in succession, disappearing on the one as it arises on the others. The chief features of the later stages of the disease are progressive paralysis and wasting of the body.

The animal knuckles over at the joints, crosses his legs in walking, trips, or trails one or both hind-limbs, and ultimately loses all power behind.

Facial paralysis is sometimes present, when the eyelids droop and the lips hang pendulous and immovable. Finally, emaciation becomes extreme, and death results from blood-poisoning and exhaustion at the expiration of various periods from one to two years.

Death results in 70 to 80 per cent of cases, and having regard to the chronic lingering nature of the malady, and the decrepit useless state to which an animal is reduced by the disease, there can be no real advantage in attempting a cure. To destroy the animal at the outset is the most rational procedure.

SOUTH AFRICAN HORSE SICKNESS

Definition.—A contagious disease, the precise cause of which has not yet been determined. It is essentially a disorder of the equine species. It occurs in relatively low-lying districts along the eastern coast of South

Africa, and appears to be in some way connected with climatic conditions. Its partiality for low, damp regions, especially during heavy rains, and its comparative absence in dry summers, clearly show that wet favours its development.

In particularly dry summers very little of the disease is observed, but when the seasons are wet and rain continuous then horse sickness prevails. February, March, and April are months during which it is most prevalent. For a long time it was looked upon as anthrax, and having regard to the suddenness with which it sometimes appears, the rapidity with which it runs its course, and the post-mortem symptoms of the malady, such an assumption was not without reason. It was, however, shown by Lieut.-colonel Dunn in 1887, that the anthrax bacillus was not present in the blood, and that whatever the cause of the disease may be, it could no longer be regarded as anthrax.

Although we have hitherto failed to determine the precise cause of the malady there is no doubt as to the inoculability of it.

Dr. Edington showed that it could be transmitted by inoculating the blood of a diseased horse directly into the body of a healthy one; but, strange to say, the serous fluid which is effused into the tissues in the course of the disease when inoculated into a healthy horse does not produce it.

Speaking of the cause, Captain J. T. Coley, C.V.S., in an able article in the *Veterinary Record* says:—"It is at present undiscovered, but probably is a very minute micro-organism, as under the highest power of the microscope, and with the present methods of staining, it is invisible; and it passes through the best-made filters, as proved by the fact that filtered blood serum (infectious) when injected produces the disease, so also does infectious blood when injected or given per orem. Yet none of the serous fluids infiltered into the tissues as a result of the disease produce it when inoculated.

"The following are theories and ideas as to the possible modes of infection, viz. ingestion, inhalation, inoculation. At present one is unable to determine if natural infection takes place by only one or more of these channels, but probably all the above methods of infection are concerned in the spread of the disease, as will be gathered from the following results which I have noted.

"The organism evidently requires heat and moisture for its propagation and vitality, appears to have a miasmatic origin, and to be transmitted by dews, fogs, and winged insects.

"**Ingestion.**—Animals which eat dew-laden grass grown in an infected district invariably suffer from the disease, but they can eat the same grass

with comparative impunity when saturated with rain. I have known instances of dew-laden grass cut in kloof or valley and given to stabled animals which contracted the disease; and of dew-laden grass from the same kloofs which was well dried in the sun the day after cutting, was also given to stabled animals a few yards distance without any fatal results.

"**Inhalation.**—I believe inhalation plays an important part in the introduction of the disease into the system. I have known two animals which were taken out of a troop and were ridden a few hours through the dense fog in a kloof contract the disease and die in ten or eleven days later, although, with the exception of mosquito inoculation, there was no other apparent mode of infection, as these animals did not get an opportunity of eating or drinking while away from their station, and they were the only two animals that died from the disease. Edington records one case of spontaneous infection from a horse suffering from the disease to its companion standing in the next stall, the animals being able to smell each other.

"**Inoculation** undoubtedly is a very probable mode of infection, and more than likely mosquitos and other winged insects act as hosts and intermediary bearers, when one considers the vast numbers in which they are bred in stagnant water of kloofs saturated with dew. All the preventive measures enumerated hereafter are more or less preventive against inoculation by mosquitos.

"**Symptoms.**—There are two varieties of the disease known by the Dutch names, dunpaard-ziekte and dikkopaard-ziekte. In the former the symptoms are, as a rule, comparatively absent until just before death. The animal appears in perfect health and vigour, and within an hour characteristic symptoms may appear, such as hurried respiration, animal lies down and gets up again immediately, soon followed by death in a few minutes.

"The symptoms usually seen in the dikkop form appear some days before death, and gradually become well defined towards the end, viz. the neck, head, and lips become swollen, in some cases enormously, the eyes close, and the lower lip droops.

"A sub-variety of this disease is called 'Blawtong', or bluetong, when the swelling of the neck and head is not marked, but mostly confined to the tongue, which presents a livid blue colour, due to intense venous congestion.

"Owing to the absence of symptoms until just before the onset of death, it was believed the disease was of very short duration. The foregoing symptoms are all that is generally noticed by farmers and horse-keepers, but if the animals in horse-sickness districts, or which have been through

such districts, are carefully inspected and their temperature taken daily, the first symptoms discovered will be fever about the seventh or eighth day after infection; and if my memory serves me correctly, when investigating this disease under the supervision of Dr. Edington, the incubation periods in animals experimentally inoculated was from six to eight days. A noteworthy feature about the temperature is that it gradually rises, and seldom, if ever, is below the previous day's temperature, taken at the same time. The morning and evening temperature will be higher than that of the previous day, although the morning temperature may be below that of the previous evening, but will be higher than that of the previous morning, and so gradually increases to 105°, and in some cases to 107° Fahrenheit, until the final stage is reached, when it suddenly drops to normal or below it.

"The primary rise of temperature is soon followed by a dusky-yellow pinkish discoloration of the conjunctiva, which is congested, and invariably petechial or stellate spots are present, which are always well marked; and generally there is a watery discharge from the eyes, and a peculiar dry husky breathing can be detected on auscultation at the trachea. In a day or two these symptoms become more marked, and are followed by œdema of the conjunctiva and eyelids, swelling of the orbital fossa, injection of the nasal mucous membranes, swelling of the neck along the jugular furrows, and in the dikkop, or big-head variety, the head and neck may be swollen to an enormous size, the eyes closed up, and the conjunctiva protruding. These symptoms are followed by weariness. The animal stands lazily, rests its head on the manger or against the wall, resting one leg then the other, and in final stages refuses food, although in the beginning appetite is unimpaired; breathing increased to thirty or over per minute, pulse small, quick, and hard, which soon becomes feeble, often intermittent, and auscultation of the heart generally gives tumultuous or palpitating sounds. There is a jugular pulse, animal lies down and soon gets up again. About this stage a yellow clear fluid discharges from both nostrils. On auscultation at the thorax, the breathing is audible, and of a gurgling sound, which gives one the impression there is a fluid in the bronchial tubes; respiration is hurried and laborious, the animal falls or lies down, and dies suddenly. Frequently, a few minutes before death, a great quantity of white froth is blown from the nostrils, and almost invariably at death this froth appears at the mouth and nose, which retains its form, and does not become fluid till some time after death.

"This froth is the yellow fluid mixed with air from the lungs, and, according to Edington, is blood serum. The commonly observed symptoms

are usually evident about the tenth day, and death takes place about ten or fourteen days after infection, and in the dikkop variety a day or two later.

"In 1898 I tried inter-tracheal injections of iodine on a case of the dikkop variety, and in twenty-four hours I was so much surprised at the improvement which took place that I decided to give this treatment a further test, and try if possible to perhaps improve on the iodine solution, which I found to give me the only satisfactory results.

"The inter-tracheal injections used were as follows:—

R.	R.
Iodine, grs. iv.	Iodine, grs. iv.
Pot. Iod. grs. xii.	Pot. Iod. grs. xii.
Ol. Terebinth, m. xv	A. Carbolic, m. xv.
Glycerine, ʒi.	Glycerine, ʒiss.
Aqua, boiled, ʒi.	Aqua, boiled, ʒi.

Injected once or twice daily.

"Of thirty-six animals treated in this way seven recovered, twenty-three died within twenty-four hours, and six died in from two to six days from date of admission.

"In some cases this treatment caused the animal undue disturbance, and coughing for about an hour after the injection; also, if given every twelve hours for two or three days the urine became blood-stained, and on post-mortem examination the kidneys were much enlarged, congested, a livid blue colour on surface, and capsule, if anything, more easily detached than normal.

"The following season I used intravenous injections, which gave more satisfactory results, besides causing practically no disturbance to the animal, so discontinued the inter-tracheal injections.

"℞ as follows:—

Iodine, grs. iv.
Pot. Iodide, grs. xv.
Glycerine.
Aqua, boiled, ʒi.

"A noteworthy feature of this treatment is the immediate effect it has on the temperature.

"In the majority of cases the temperature drops from one or two degrees within twenty-four hours after the first injection, and a gradual decrease of temperature afterwards is a favourable sign; also, the ecchymosis on the conjunctiva is much improved in twenty-four hours.

"If the disease is discovered the first or second day of the fever, two

or three injections usually effect a cure. If the animal is only treated early enough in the disease the chances of recovery are greatly increased.

"All the recorded cases developed undoubted clinical symptoms of horse sickness.

"In my hands over 66 per cent of such cases recovered; but I do not claim that all horses with a rise in temperature were suffering from the disease, as coincidences are bound to occur, but I claim that the greater number of them, if left untreated or treated by old methods, would have died of horse sickness."

"**Preventive Measures.**—All animals should be stabled before sunset, and not removed from stables until some time after sunrise, when the dew and fog have disappeared. Smoke should be kept going through stables or picket-lines, from small smouldering fires on windward side during the night.

"If possible, remove animals to high veldt pastures where frost prevails.

"Protect animals from bites of winged insects, particularly mosquitos and their species.

"Prevent animals from eating dew-laden grass until it is well dried in the sun.

"Kraal horses with cattle at night, as the ammoniacal gases from excrement prevents winged insects and mosquitos from infecting the place.

"Animals which have to traverse districts infected with horse sickness, and remain in them during the night, if not stabled, should have nose-bags on, previously steeped in antiseptic fluid, sanitas for preference. Nose-bags are used by prospectors and game-hunters in infected districts with success, tar being smeared on bag and nostrils. They are put on before sunset, and taken off after sunrise. This plan prevents grazing, and acts as an antiseptic inhalation.

"A weak solution of paraffin-oil, lightly brushed over the animal every evening, is an excellent preventive to mosquitos, and should be used on all animals not stabled; and arsenic given daily is also beneficial, perhaps owing to its antiseptic action on the alimentary tract.

"Preventive inoculation, if successful, no doubt would be supreme, as it would enable animals to live and work in the worst horse-sickness districts.

"When protective inoculation can be employed throughout the whole country, and animals rendered immune, it will be of great benefit both from an agricultural and equine point of view. Dr. Edington produced an attached virus and serum for protective inoculation, which experimentally he has employed with success, but I am unable to say what the practical results of this method are.

"'Salted' horses are animals that have recovered from the disease, and they possess a high degree of immunity.

"They often suffer from secondary fever during the horse-sickness season, which is not attended with much constitutional disturbances, but undoubted cases which recovered are known to have died from a secondary attack of the disease one or more seasons after the first attack."

EPIZOOTIC LYMPHANGITIS

English literature is seriously deficient in articles referring to this disease. True, so far as we are aware, the malady only appeared in this country in 1902, following upon the war in South Africa, and no immediate need of giving it attention had arisen.

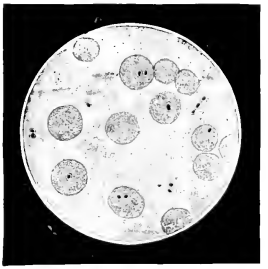


Fig. 222.—Bacillus of Epizootic Lymphangitis

Its prevalence in France, Sweden, India, Russia, Japan, China, Italy, Egypt, &c. &c., had not been considered of sufficient importance to demand the attention of Englishmen.

Seeing that the disease is so much like farcy, and excepting by means of microscopic inspection or mallein indistinguishable from it, there is no direct evidence of its absence from our studs, but we think and believe it has but recently acquired a footing in the country by the return of infected animals from South Africa.

Definition.—A contagious and inoculable disease characterized by the development of abscesses and cording of the lymphatics of the skin. It is essentially a local disease, due to a minute organism or cryptococcus which gains access to the tissues through an open wound. The organism is lemon-shaped, having one end slightly smaller than the other. It measures from 3 to 4 μ in diameter, and is very easily found in the discharge with a suitable microscope. Seen by this means it presents a double contour, and is highly refractile. It is either free or enclosed in pus corpuscles.

The classification of the parasite is not quite clearly made out. As to whether it should be placed among the sporozoa or saccharomyces must be left for the present to those who have given the matter attention.

Staining.—Although the organism is readily seen without being first stained, some may prefer to stain it, and we therefore give the most easy and at the same time most effectual method of carrying out this procedure.

"Make a thin smear of pus from the suspected wound, ulcer, or pustule on a cover glass or slide, fix it in the ordinary manner by passing it three times through the flame, and then proceed to stain with the following preparation:—

Nicolle's Violet, saturated solution of gentian violet in 90 per cent of alcohol, 10 cc.
One per cent Aqueous Solution of Carbolic Acid, 100 cc.

"Leave the stain on for about five minutes, then run it off, removing the superfluous stain by waving it for a moment or two in water, and put on:—

Grammes Iodine Solution—

Iodine	1 part
Iodide of Potassium	2 parts
Distilled Water	300 „

"This fixes the stain in the organism. After leaving it in for two or three minutes run it off and treat with alcohol, which takes the stain out of everything except the various organisms which have taken it up, in fact it will begin to remove it from the cryptococci also if left on for more than a few seconds.

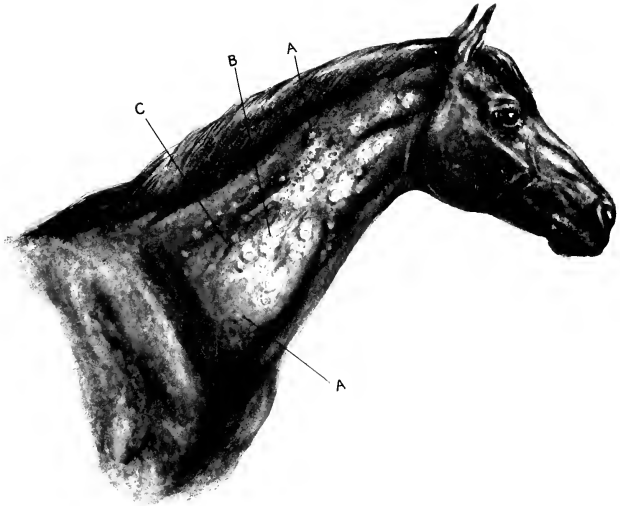
"Having now decolorized put on the following counter stain:—

Saturated Solution of Vesuvine (Bismarck Brown),

and after having left it on for about three minutes run it off, wash in water, and dry. The specimen is now ready to be examined under the microscope, or may be mounted in Canada Balsam." (Pallin.)

Causes.—Any wound on any part of the surface of the body with which the virus may be brought into contact offers an opportunity for infection. A brush on the fetlock joint or a crack in the heel will account for its ofttimes occurrence on the hind limbs, a broken knee or a less marked injury to some other part suffices to explain its less frequent occurrence in the fore-legs. Injury to the face, the poll, the withers, or back by the harness will expose the animal to infection, as will also wounds following upon castration and breaking of abscesses in strangles.

Zoological Distribution.—Although solipeds would appear to be the only animals affected by it, it has been said to have occurred in cattle, and in referring to this Pallin remarks: "Care should be taken not to confound it with a disease found among the cattle in Guadeloupe known under the name *farcin de bœuf*, and due to a bacillus discovered by Nocard, and which Metschnikoff describes as a streptothrix. This



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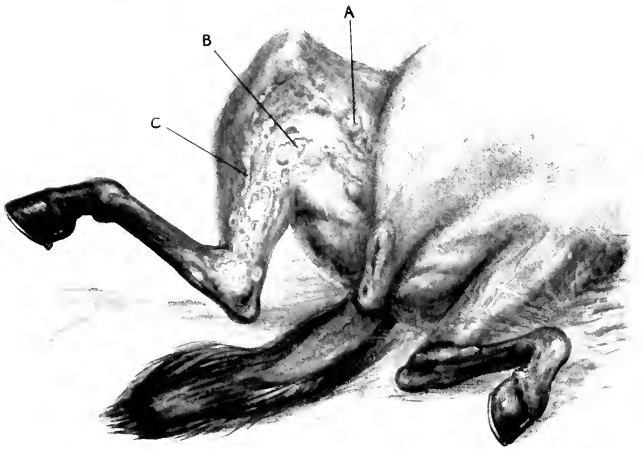

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EPIZOOTIC LYMPHANGITIS

1. AA, abscesses in the course of formation; B, ulceration of skin and subcutaneous tissue following upon breaking of abscesses; C, inflamed lymphatic vessels. 2. A, abscess in the course of formation; B, ulceration of skin and subcutaneous tissue following upon breaking of abscesses; C, inflamed lymphatic vessels.

disease is only transmissible to cattle, sheep, and guinea-pigs, but does not affect horses or donkeys."

Diagnosis.—Contagious lymphangitis until comparatively recent times and in every country where it is known has been confounded with farcy. It is only since the adoption of bacteriological methods, and later by reason of the mallein test, that any difference has been recognized. Examination of the matter taken from abscesses in the skin shows at once the cryptococcus as a minute lemon-shaped organism having a highly refractile double outline. Moreover, the mallein test fails to give the fever reaction and the local swelling commonly associated with glanders.

Mallein when used alone leaves the mind in doubt, but if the organism be present, then there need be no reason to hesitate to give an opinion.

Points of difference between epizootic lymphangitis and farcy are at first sight not great, but in the matter of diagnosis nothing short of finding the cryptococcus on which the disease depends should be considered sufficient, and especially as this is by no means difficult of accomplishment.

The time which elapses between the reception of the poison and the outbreak of disease is, like glanders, very variable, and may be expected any time between five weeks and four or five months, and in some instances it has been known to exceed a year.

One attack of the disease does not prevent a second.

Under the most favoured circumstances the average mortality is said to be about "ten to fifteen" per cent, but in a disease which lasts so long, is so liable to recur after long periods, and is generally so uncertain and unsatisfactory, it would be difficult to say exactly what the mortality may be, and in large studs of horses to trifle with a disease of this description would be carrying risk to the verge of ruin.

Symptoms.—It is strange that a disease which is considered sufficiently serious to be scheduled as a contagious and dangerous malady should have practically no constitutional symptoms. The importance of the disease evidently does not dwell in its life-destroying danger, but in the fact of its contagious and crippling nature.

The value of a horse depends entirely on our power to use him, and in this disease he is for the most part and for long periods removed from our will to do so. Moreover, so long as he remains in our stables he is a source of danger to others, and although he may ultimately become well again he is nevertheless likely to infect his companions while doing so, and above all to leave the stable a centre of infection.

We were surprised a short time ago in looking over an infected stud to find all the horses, notwithstanding the disease, in good condition, full of flesh, feeding well, the temperature and pulse normal, and the coat sleek.

The local symptoms invariably attack the skin, sometimes the mucous membranes of the nose and eye are also involved, especially as the result of auto-inoculation while scratching or rubbing infected places.

All parts of the body, wherever there is a wound to admit the virus, are liable to become the seat of the disease.

From four to six weeks after infection a small hard nodule appears on the site of inoculation, and the lymphatics about it may be felt beneath the skin, or the latter may be first enlarged or "corded" to the feel.

In some cases it has been noticed that a general enlargement of the limb occurs, and the lymphatic enlargement is only recognized when the swelling has subsided.

The primary nodule and lymphatic vessels continue to enlarge until the latter stand out as distinct lines radiating from the former. At first the nodule is hard and small, but ultimately reaches the size of a walnut or a hen's egg. At this time it is soft and fluctuating, and soon breaks and discharges a quantity of pus, which is remarkable for its thick sticky nature, a character which does not belong to the pus of farcy. This is soon followed by the development of granulations, which not only fill up the cavity but likewise extend beyond it in the form of proud-flesh. With the discharge of pus the edges of the wound have a tendency to fall in, but this is soon prevented, either by the development of granulation and the filling up of the wound, or by the ulceration and loss of the skin.

In all cases the wound has an indurated base, the surrounding connective tissue having taken on a slowly progressive inflammation, of which abscess is the result.

In some instances there are chains of abscesses running along the line of the thickened lymphatic vessels, and breaking out at varying intervals of time, so that abscesses entire, broken, and in process of repair may sometimes be seen side by side.

When a swelling is cut into in the early period of the disease, it is found to be hard and grayish-white in colour. There is a considerable connective tissue new growth in the part, and as the point of ripening is reached a dark vascular area appears, in the midst of which suppuration proceeds and continues until an abscess is developed.

It is, however, not always the case that suppuration is the immediate result. In some cases the swelling subsides, and apparently for the time it disappears, but sooner or later it reappears and goes through the usual process of abscess formation.

When the disease attacks the mucous membrane of the nose, "the lesions are first noticed in the form of small papules or pimples, which

rapidly form into vesicles and burst, forming a well-defined ulcer with a raised edge and dug-out centre. They are at first isolated, but later become confluent and tend to extend to the cartilage of the septum nasi, causing the mucous membrane to become discoloured and greatly thickened by exuberant granulations, at times forming a kind of polypus which interferes with respiration and causes snuffling. In advanced cases the cartilage becomes spongy and the nasal bones increased in thickness. Enlargement of the submaxillary glands may, but does not necessarily, as it is stated in glanders, accompany nasal symptoms; *i.e.* it is not constant, and does not occur even in advanced cases. However, when it is involved the gland may be somewhat indurated and stiff from suppurative inflammation either affecting it or the surrounding tissues; but it is generally movable, and seldom or never fixed to the jaw and knotty, as in glanders." (Pallin.)

Treatment.—Eighty-six per cent of cases of epizootic lymphangitis are said to recover, but the precautions, and the thoroughness with which they require to be treated, the close attention they demand, extending over long periods, and the possibility of a recurrence—to say nothing of the risk of scattering the disease—has placed it outside the pale of treatment, and unless the horse is of the highest value we would recommend that he be destroyed at once.

From the point of view of the sanitary economist, this is the only course short of allowing it to spread and to gain a permanent footing in our studs.

Captain Martin, A.V.D., thinks that stamping out the disease by slaughter will not act any more quickly than stamping it out by isolation and treatment, and that destruction of cases before giving them a trial with treatment is in his opinion a waste of money, and the only advantage he recognizes is a slight saving of a little trouble. Captain Martin, however, does not fail to recognize the serious nature of the disease. "Its insidious method of spread due to the long incubation period, and the tenacity of life of the organism together with the prolonged treatment necessary for a cure, will always mark the disease as a serious one; but," he says, "there should be no difficulty in eradicating the disease from any stud by careful isolation, and adopting correct methods in the treatment of all wounds."

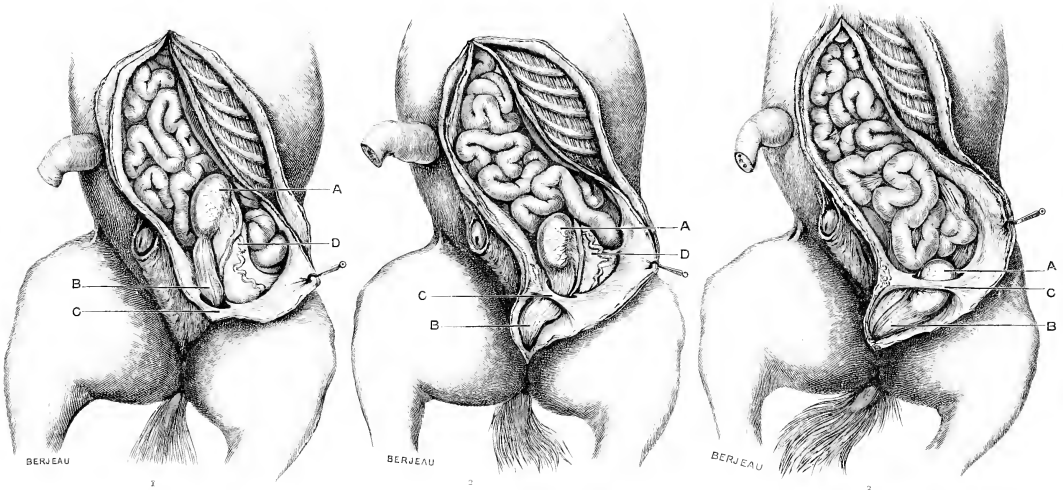
Whatever may be the result of treatment, we beg to differ from Captain Martin when he says that "stamping out by slaughter will not act more quickly than stamping out by isolation and treatment", and as for the few pounds he thinks we may waste or the little trouble we may escape by immediate destruction of the affected animals, we shall

have the satisfaction at least of knowing that the animal and its contagion have been put out of the way for ever, and is therefore incapable of doing harm.

Of the horses attacked in the British army sixty-four per cent have already been killed. Why, we should like to know, has it been found necessary to destroy all these animals? The only interpretation which can be put upon the action of the army authorities is that of stamping out the disease, and so far as we can see it is the only rational course open to them. It is quite understood that others in their charge suffering from the disease still remain alive, and it is to be hoped that these will sooner or later be dealt with in the same manner. To count on its being recognized early enough, or being treated with that laboratory exactness, when discovered, which Captain Martin lays down as necessary, is placing far too much confidence in both the horse-owning public and the veterinary surgeon.

Principally the disease is, at the present time, in our military hospitals, and if it is not intended to allow it to escape, every horse now suffering from it should be destroyed. Epizootic lymphangitis is contagious, and although not immediately destructive, it is nevertheless dangerous by virtue of its long-continued and crippling effects, and every effort should be put forward to stamp it out while it is confined within a narrow area.

The serious aspect of the disease has led the Board of Agriculture and Fisheries to include it with the contagious affections against the spread of which their efforts are chiefly directed, and an Order which came into operation on the 6th of April, 1904, and drawn very much on the lines of that of glanders, has made it compulsory on the part of any person possessing an animal so affected to give notice of it to the police, "when a local Authority, on being satisfied by an inquiry under the preceding article of the existence of epizootic lymphangitis, shall forthwith take such steps as may be practicable to secure the isolation of any horse affected with or suspected of that disease, and for that purpose an inspector of a local Authority may serve a notice in writing . . on the owner or person in charge of any horse, requiring that such horse be detained on or in any field, yard, stable, shed, or other place specified in the notice, and after the service of such notice it shall not be lawful for any person to move such horse from or out of such place of detention, or to permit any other horse to come in contact with any horse to which the notice applies, or to remove from or out of such place any carcase of a horse or any dung, fodder, litter, or other thing that has been in contact with any horse to which the notice applies."



THE DESCENT OF THE TESTICLES

1. Testicle within the Abdomen before its descent. 2. Testicle within the Abdomen on its way to the Scrotum or Purse. 3. Testicle passing through the Inguinal Ring.
A. Testicle. B. Gubernaculum Testis by which it is guided through. C. Inguinal Ring. D. Spermatic Artery.

The Board might even have gone further, and have directed that all horses should be at once destroyed, and compensation paid to the extent of three-fourths of their value at the time when they became infected.

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10. THE ORGANS OF REPRODUCTION

ANATOMY OF THE MALE ORGANS OF GENERATION

The principal organs which subserve the function of reproduction in the male are: (1) the testis, (2) the excretory ducts which convey the spermatic fluid to the urethra, (3) the urethra, (4) the penis.

The testis in the fœtus first appears behind the kidneys (see Plate XXXIV) on the under surface of the loins, from which it hangs suspended in a pouch of peritoneum (the mesorchium). At this time it is connected with the scrotum by a band of unstriated muscle (gubernaculum testis), the gradual contraction of which draws the organ through the inguinal canal into the scrotum or purse, which it reaches about the time of birth.

Coverings of the Testicle.—In its descent the testis becomes invested with two coverings of peritoneum—one, the tunica vaginalis, derived from the roof of the abdomen, is closely adherent to its outer surface; the other, the tunica vaginalis reflexa, forms a loose pouch in which it is enclosed. This membrane is derived from the floor of the belly being pushed before the testicle as it enters the inguinal canal on its way to the scrotum. The two opposing surfaces of these coverings possess the power of secreting a watery fluid, so that, being constantly in a moist condition and perfectly smooth in themselves, the movements of the organ within its sac are permitted to take place with the least possible friction.

The Inguinal Canal, about 4 to 6 inches in length, is a passage through the abdominal wall. Before birth it is occupied, as we have already stated, by the gubernaculum testis (see Plate), which, on the descent of the testicle into the scrotum, gives place to the spermatic cord. It has two openings—one above: the *internal abdominal ring*, by which the testis enters; and another, much larger, below: the *external abdominal ring*, by which it emerges into the scrotum.

Testis.—The testis (fig. 223) in the horse weighs approximately about 8 ounces. It is oval in shape, with somewhat flattened sides, and hangs suspended by the spermatic cord in the scrotum. The testicle is a gland made up of a number of tortuous tubes enclosed in a somewhat thick, dense, fibrous capsule. A long narrow body termed the *epididymis* runs along

the outer part of the upper border; this is not a part of the testicle proper, but an appendage to it, and consists of the excretory ducts of the organ thrown into a number of closely-united coils. The anterior extremity of this body is large and rounded, and is called the "*globus major*" (G, fig. 223). The ducts of which it is composed are continuous with those of the testicle. The posterior extremity, much smaller than the anterior, is the "*globus minor*" (B, fig. 223); from it springs the "vas deferens", or chief excretory duct of the gland.

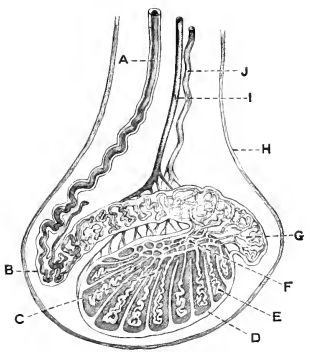


Fig. 223.—Section of Testis showing the arrangement of the Ducts composing the Testicle

A, Vas Deferens or Spermatic Duct. B, Globus Minor. C, Vasa Recta or Straight Seminal Tubules. D, Tunica Albuginea. E, Spermatic Tubules forming the Lobules. F, Rete Testis or net-work formed by the straight tubes. G, Globus Major. H, Tunica Vaginalis Reflexa. I, Spermatic Vein. J, Spermatic Artery.

Tunica Albuginea.—This is a dense membrane not unlike the sclerotic coat or white of the eye. It is made up of a number of closely-interwoven strands of white fibres, and encloses within it the glandular or secreting structure of the organ (D, fig. 223).

At the superior border of the testicle an offshoot from this tunic dips down into its substance for a short distance, forming an incomplete vertical partition, which Sir Astley Cooper named the "*mediastinum testis*". In this ramify the small blood-vessels of the gland, and a net-work of seminal ducts termed the "rete testis" (F, fig. 223). There are also given off from it numerous fibrous cords, which, after dividing the gland up into a number of incompletely-separated compartments, become united with the interior of the tunic from which they spring. These strands of fibrous tissue preserve the shape of the gland, and serve as a matrix by which the blood-vessels traverse its structure.

The blood supply to the testis is derived from the *spermatic artery* (J, fig. 223), whose branches on entering the organ form a close net-work over the inner surface of the *tunica albuginea*, which is known as the "*tunica vasculosa*".

Gland Substance.—The substance of the testicle is composed of large numbers of minute convoluted tubes termed "tubuli seminiferi" (E, fig. 223). These are grouped together in small masses or "lobules", and occupy the

spaces, already referred to, into which the organ is divided by strands of fibrous tissue given off from the "mediastinum testis". Although occupying separate compartments the tubes of one lobule freely communicate with those contiguous with it. The semen secreted by the seminal tubes is conveyed to the "mediastinum testis" by a number of straight ducts, "*vasa recta*" (fig. 223c), which there unite and form a net-work, the rete testis. The secretion then leaves the testicle by means of the "*vasa efferentia*", a group of vessels, each of which twists and turns upon itself to form a conical mass, "*coni vasculosi*", and these together constitute the globus major. From the globus major the "*vas deferens*" or main excretory duct takes its origin, and after twisting and turning about to form the *globus minor*, continues its course upward along the inguinal canal to the pelvis, where, after reaching the upper surface of the bladder, it becomes enlarged, and after joining with the duct of the vesicula seminalis it opens into the prostatic portion of the urethra by the *ejaculatory duct*.

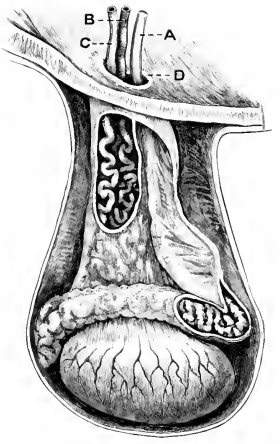


Fig. 224.—Constituents of Spermatic Cord

A, Vas Deferens or Spermatic Duct. B, Spermatic Vein. C, Spermatic Artery. D, Internal Abdominal Ring.

Spermatic Cord (fig. 224).—This is the structure by which the testis is suspended in the scrotum. It is composed of arteries and veins, the former going to and the latter from the organ, of nerves and lymphatics, as well as the excretory duct (*vas deferens*) by which the seminal fluid is conveyed into the urethra. The arteries and veins are remarkable for the winding course they take in approaching and leaving the gland.

The Scrotum.—The scrotum, commonly called the "purse", is a bag in which the testes are suspended by the spermatic cord. It is composed of six layers, the chief of which are the skin and the *dartos*.

The skin is an extension of the common integument, but much thinner and more supple than that found in the more exposed parts of the body. It possesses, besides, a large number of sebaceous glands, whose unctuous

secretion is constantly being thrown out to lubricate the surface. By this means the scrotum is enabled to move freely over the thighs without irritation.

The dartos is a thin pinkish-yellow layer of involuntary muscle and elastic fibres, largely interspersed with connective tissue. It is situated

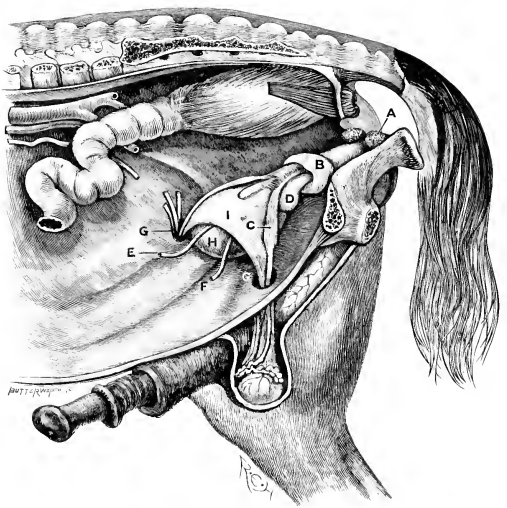


Fig. 225.—View of the Male Genital and Urinary Apparatus

A, Cowper's Glands. B, Prostate Gland. C, Dilated portion of Spermatic Duct. D, Vesicula Seminalis. E, F, Ureters. G, G, Spermatic Vessels and Duct passing through the internal abdominal ring on their way to the Testicle. H, Bladder. I, Layer of Peritoneum.

beneath the skin, and forms a pouch for each testicle by interposing a partition (septum scroti) between one organ and the other.

When the dartos contracts the testicle is raised in the purse; at the same time the skin is corrugated.

Vesiculæ Seminales.—Two small elongated sacs situated on the upper surface of the bladder (fig. 225 D); they form reservoirs for the reception of the semen, and secrete a fluid accessory to that of the testicles which is mixed with it. As we have already seen, the duct of each of these bodies unites with that of the corresponding vas deferens to form the ejaculatory

duct through which the semen is discharged into the prostatic portion of the urethra.

THE PENIS

The penis (fig. 226) is the male organ of copulation.

In a quiescent condition it is hidden away in a double fold of skin termed the "sheath" or "prepuce", from which, in a state of erection, it protrudes for some considerable distance. The posterior part of the organ between the perineum and the scrotum, being somewhat closely bound down

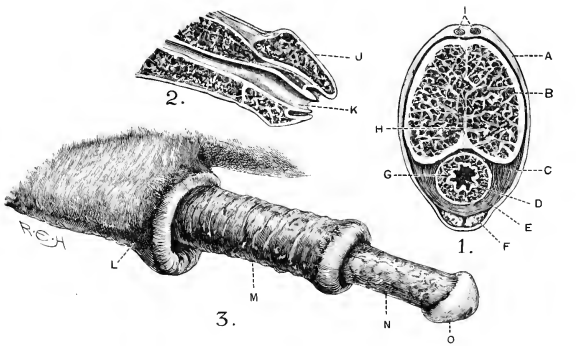


Fig. 226.—The Penis

1, Transverse Section of Penis. I, Anterior Dorsal Arteries; A, Fibrous Capsule; B, Corpus Cavernosum; C, E, Accelerator Urinæ Muscle; D, Urethra or urinary passage; F, Retractor Penis Muscle; G, Corpus Spongiosum; H, Septum Pectiniforme. 2, Longitudinal Section of Glans Penis. J, Glans Penis divided; K, Urethral Canal. 3, Penis unsheathed. L, Prepuce or Sheath; M, N, Mucous Membrane thrown into folds; O, Glans Penis.

to surrounding structures, is called the "fixed" portion. The rest, which is enclosed in the sheath, and capable of being projected or withdrawn, is the "free" portion. It commences behind in two branches or cruræ, which become attached to the ischial tuberosities, and after uniting pass forward between the thighs, where it is suspended by a layer of elastic tissue, and terminates in front in a rounded extremity enclosed by the *glans penis*.

When in a state of erection it is seen to be covered by a thin moist unctuous-looking membrane, which is a continuation of the loose skin forming the inner fold of the sheath. At the extremity of the organ this membrane is much reduced in thickness, and after closely investing the "glans" enters the orifice of the urethra, and becomes continuous with its mucous lining membrane.

For the most part the penis is made up of three elongated parallel bodies, the "corpora cavernosa" and the "corpus spongiosum".

The two "corpora cavernosa" (B, fig. 226) commence behind in two tapering processes called the *crura*, which, after uniting together at the root of the penis, continue forward to form the body, and terminate in two rounded extremities over which the glans penis fits like a cap.

When divided transversely, the corpora cavernosa are seen to be surrounded by a dense fibrous coat of considerable thickness. Although closely united together at their circumference, they are partly separated by an imperfect septum or partition, which, when viewed laterally, somewhat resembles the teeth of a comb; hence it has been termed the "*septum pectiniforme*". The partition is derived from the outer fibrous coat, and becomes more and more complete as it reaches the root of the penis. The interior of the corpora cavernosa is divided into a number of small cells by a net-work of elastic septa, which interlace each other in all directions, and give the divided surface the appearance of a sponge. At the time of erection all the spaces so formed are filled with blood, their elastic walls are put on the stretch, and the volume of the organ is correspondingly increased.

When the blood leaves the cells erection ceases.

The arteries of the corpora cavernosa are derived from the pudic.

Corpus Spongiosum.—This, the smaller of the three bodies composing the penis (G, fig. 226), is situated in a groove which runs along the lower border of the corpora cavernosa. Behind, it commences at the perineum in an enlargement termed the "bulb", and terminates in front in an expanded free extremity, which during erection resembles the rose of a watering-can. This is the "glans penis".

The corpus spongiosum is composed of a loose erectile tissue, similar in appearance to that of the corpora cavernosa, but of much finer texture. The urethral canal, by which the urine is conveyed from the bladder, is surrounded by it for the greater part of its length, and a thin muscle (accelerator urinæ) encloses the whole from the ischial arch behind as far forward as the glans.

This muscle, by compressing the urethra from behind forward, expels the last few drops of urine after the efforts of the bladder have ceased.

The Prepuce (L, fig. 226), commonly spoken of as the "sheath", is a double layer of loose skin folded inward to form a recess in which the free portion of the penis is enclosed.

The inner fold of the prepuce, although continuous with the outer skin, partakes of the character of mucous membrane. It is thin, supple, vascular, and freely lubricated with an unctuous greasy matter, secreted by numerous

sebaceous glands which exist in and beneath it. It is this substance which, on becoming inspissated and dry, forms the dark gray masses which accumulate in the scrotum, and sometimes provoke irritation and disease. During erection this inner layer is effaced, and forms a covering to the body of the organ as it protrudes from the prepuce. The sheath is supported by an elastic band—"suspensory ligament" of the sheath—reflected from the under surface of the abdomen.

The loud gurgling sound emitted by some horses when in motion is due to the sudden displacement of air by the to-and-fro movements of the penis within the sheath.

URETHRA

The urethra (D and K, fig. 226) is a long tube extending from the bladder to the end of the penis. It conducts the urine out of the body, and serves also to convey the spermatic fluid and some other secretions accessory to reproduction into the female organs of generation in the act of copulation.

In proceeding from the neck of the bladder, the urethra passes backwards for a short distance along the floor of the pelvis; then curving downward over the ischiatic arch, it takes a direction forward between the two branches or cruræ of the corpora cavernosa, from which it continues onward, enclosed in the corpus spongiosum, to the glans penis. There it ends in a small cylindrical projection termed the "urethral tube". On leaving the neck of the bladder it is surrounded by the prostate gland, and then for a farther short distance by a thin muscle, the "compressor urethræ", after which it is enclosed in the corpus spongiosum for the remainder of its course, excepting the small terminal prolongation from the glans penis.

These three divisions are distinguished as (1) the "prostatic", (2) the "muscular" or "membranous", and (3) the "spongy" portion. An inspection of the interior of the canal shows it to vary in diameter in different parts of its length. The smallest part is the external opening, which will admit a catheter about half an inch in diameter. It may be concluded, therefore, that any instrument that will enter this opening may be safely pressed on into the bladder. The larger parts are the prostatic, and those situated at either extremity of the spongy portion.

Openings into the Urethra.—Besides the inlet from the bladder by which the urine escapes, there are a number of openings into the urethral canal. In the prostatic portion, on either side of a small ridge of mucous membrane, is the orifice of the "ejaculatory duct", through which the seminal fluid is discharged in the act of copulation. These openings in aged stallions are of considerable size, in some instances sufficiently large

to admit the point of the index-finger. This fact must be borne in mind when passing the catheter, lest the instrument becomes lodged in one of them. To guard against it the point should be well pressed down on to the floor of the canal by the fingers acting through the perineum.

A little behind the ejaculatory ducts are two rows of small openings from the prostate gland, and beyond these occur others similarly arranged proceeding from Cowper's glands.

MUSCLES OF THE URETHRA

The Accelerator Urinæ (E, fig. 227).—This muscle extends nearly the whole length of the spongy portion of the urethra, commencing at the

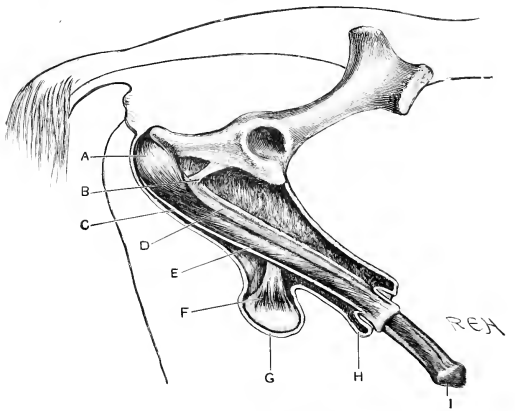


Fig. 227.—Suspensory Ligament of Penis

A, Erector Penis. B, Suspensory Ligament of Penis. C, Retractor Penis. D, Corpus Cavernosum. E, Accelerator Urinæ. F, Cremaster Muscle. G, Scrotum. H, Prepuce or Sheath. I, Glans Penis.

ischiatic arch and continuing as far forward as the glans penis. It is composed of a thin layer of fibres arranged around the corpus spongiosum, which it almost completely invests. When it contracts, the walls of the urethra are brought together and its contents are expelled.

The action of this muscle is specially designed to expel the last small portion of urine which remains in the canal after the bladder has emptied itself. It also assists in ejecting the semen from the urethra in the act of copulation

Wilson's Muscle.—This muscle is composed of two portions, one spread over the upper, and the other over the lower surface of the membranous portion of the urethra. At either side the two layers unite together, and are attached right and left to the inner lateral wall of the pelvis.

When the two layers of this muscle contract, the walls of the urethra are brought together, and the escape of urine from the bladder is prevented. By the same means it prevents the semen from entering the bladder when it emerges from the vesiculæ seminales in the act of copulation.

Two other muscles, the "ischio-urethral" and the "transverse perinei", are also concerned in acting upon the urethra.

MUSCLES OF THE PENIS

Erector Penis (A, fig. 227).—These are two short, thick fleshy muscles which arise from the crest of the ischium, and are inserted into the crurae of the penis.

They assist in bringing about erection, by preventing the free outflow of blood from the corpora cavernosa and causing an engorgement of its cells and vessels.

Retractor Penis (C, fig. 227).—This consists of two bands of pale unstriped muscle, which arise from the under surface of the coccygeal or tail bones, and after winding round the rectum converge together below the anal opening, and are continued forward beneath the corpus spongiosum to the extremity of the penis.

Contracting, they draw the penis back into the sheath after erection.

ANATOMY OF THE FEMALE ORGANS OF GENERATION

The entrance to the uro-genital passage in the female is a vertical fissure some 4 or 5 inches in length, bounded on each side by a skin fold (the *labium magnus*). The folds meet above at an acute angle, separated from the anus by a bare, usually dark-coloured patch of skin, about 2 inches in extent, known as the "perineum". Below, the meeting of the lips is more obtuse. Supporting the folds, and passing round the opening, is a voluntary muscle (*post sphincter*), which is separated from the skin by a considerable quantity of loose areolar tissue.

If the labia are separated it will be seen that they are covered internally by a smooth, moist, pale-coloured mucous membrane. Just within the lips, in the lower angle of the fissure, will be noticed a small prominence

something like the glans penis of the male. This is the "clitoris"; the little body is partly contained within a prepuce formed by the coming together of two short folds of mucous membrane corresponding with the "labia minora". The integument covering the organ and lining its sheath is richly supplied with glands of a sebaceous type, which form a substance similar to the blackish gray secretion (smegma) commonly found in the sheath of the male. The clitoris can be raised and its glans turned

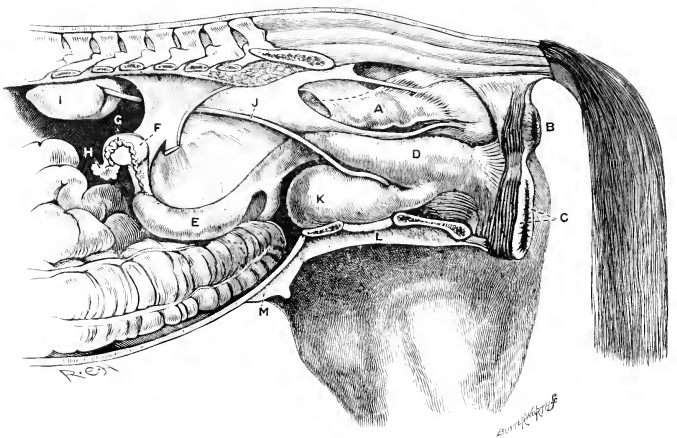


Fig. 228.—View of the Genito-urinary Organs of the Mare

A, Rectum. B, Anus. C, Vulva. D, Vagina. E, Left Horn of Uterus. F, Ovary. G, Fallopian Tube. H, Its Fimbriated extremity. I, Kidney. J, Ureter. K, Bladder. L, Pelvis. M, Mammary Gland.

directly backwards. This action is well seen immediately after urination and at frequent intervals during the period of œstrum.

The cavity between the labia, into which the hand can be introduced, is the "vulva"; it extends inwards for 4 or 5 inches, and is bounded in front by the rudiment of the hymen, a small membranous fold which separates it from the vagina. The vulva is lined by pink mucous membrane, and kept moist by the secretion from numerous small mucous glands embedded in its structure. Outside the mucous membrane there is much loose connective tissue to allow of expansion of the passage during parturition, and large plexuses of veins. Outside this again are muscle fibres

continuous with the posterior sphincter, and which in front become thickened to form an anterior sphincter. Opening on to the floor of the cavity, about 4 inches within the lips, is the urethra or urinary passage (fig. 229, H). This orifice is covered by an ample fold of mucous

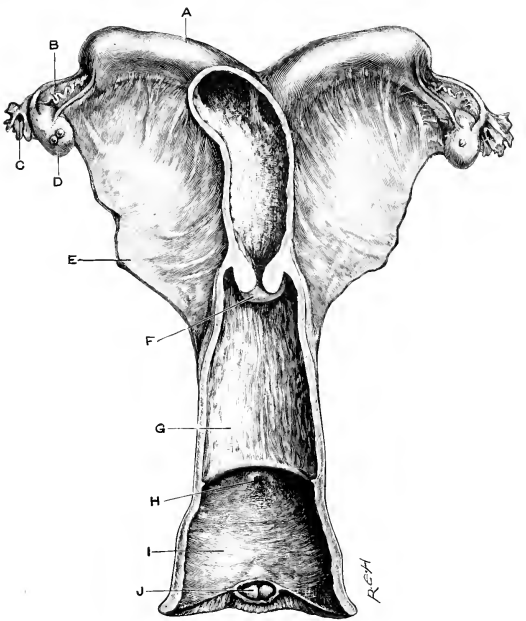


Fig. 229.—Female Organs of Generation

A, Left Horn of Uterus. B, Fallopian Tube. C, Fimbriated extremity of the same. D, Ovary. E, Broad Ligament. F, Os Uteri. G, Vagina. H, Opening into Bladder. I, Vulva. J, Clitoris.

membrane having its free edge directed backwards; above it is the large orifice leading to the vagina, encircled at its margin by the rudiment of the hymen, a membranous fold often hardly noticeable. When present in a state of full development it is ruptured at the first service, and its remains are then known as the "carunculæ myrtiformes". The vagina extends forwards from the hymen to the uterus, and is about 9 inches in length. Project-

ing into its anterior extremity for about $1\frac{1}{2}$ inch is the neck of the uterus. The vaginal passage is lined by pale-red mucous membrane thrown into longitudinal ridges extending along its whole length. Outside the mucous membrane is a plentiful areolar tissue in which are large venous plexuses and layers of unstriated muscle fibre; outside this again are muscular layers, longitudinal and circular, continuous with those of the uterus. Beneath the vagina are the urethra and the bladder (K, fig. 228), and above it the rectum (A, fig. 228).

Uterus (fig. 230).—This is the organ which receives the ovum and in

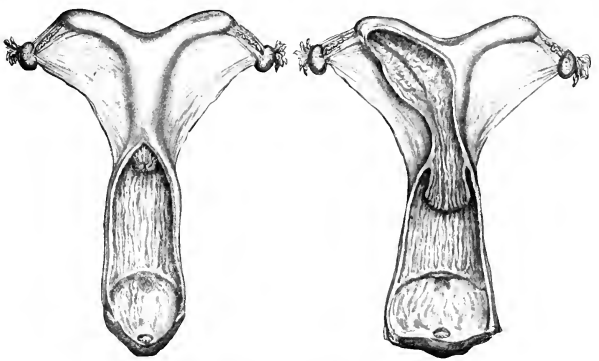


Fig. 230.—Uteri with Short and Long Necks

which the fœtus is developed. It is composed of a neck and a body, which divides into two horns of approximately equal size.

The neck is embraced by the anterior extremity of the vagina, into which it projects after the manner of the end of a tap into a barrel; it is rounded in outline though somewhat compressed from above downwards. The opening of the neck into the vagina is called the "os uteri externum". The opposite extremity opens into the body of the organ, and is the "os uteri internum". The body of the uterus is about 8 to 10 inches in length, and is situated partly within the pelvis and partly in the abdomen, having the rectum above and the bladder below. The horns are about 8 inches in length, and hang suspended by two broad ligaments from the lumbar portion of the spine. They are somewhat laterally compressed, are concave on their upper surface and convex on the lower. The anterior extremity is obtusely pointed, and receives the

Fallopian tubes. The opposite extremity is continuous with the body of the organ.

Structure.—The wall of the uterus is composed of the following structures arranged in the following order from without inwards:—(1) serous or peritoneal covering, which invests the entire organ with the exception of the cervix or neck. (2) Muscular coat, composed of longitudinal and circular fibres. (3) Sub-mucous areolar tissue. (4) Mucous membrane raised into longitudinal folds and containing numerous tubular glands.

Attachments.—The whole uterus, with the exception of that portion of the neck within the vagina, is covered with peritoneum, which, branching off from the organ in various directions, forms the ligaments by which it is attached to the rectum above, the bladder below, and to the sides of the pelvis and the roof of the belly.

The recto-vaginal ligament leaves the lower face of the rectum and passes on to the upper surface of the vagina and uterus. The vesico-vaginal ligament leaves the lower surface of the uterus and vagina and passes on to the upper face of the bladder. The broad ligaments are simply the lateral edges of the folds reflected from the sides of the organ and attached at first to the sides of the pelvis, from which they rise to the roof of the abdomen and support the uterine horns. Hence it will be seen that the lateral ligaments form a horizontal partition (fig. 229, E) composed of an upper and a lower layer between which the uterus is placed. The only other ligament of any importance is the round ligament (fig. 231, G). This is a fibro-muscular cord situated between the layers of the broad ligament, and is attached to the concavity of the upper part of the horn of the uterus and to the floor of the abdomen in front of the pubic bone. The uterus, therefore, is supported and held in position (1) by the projection of its neck into the vagina, (2) by a peritoneal fold connecting it to the rectum above, (3) to the bladder below, and (4) to the sides of the pelvis.

Between the layers of the broad ligaments there are several other structures of importance in relation to the generative function, about some of which something must be said. There are (1) the Fallopian tubes, (2) ovarian ligaments, (3) the ovaries and the vessels and nerves distributed thereto and to the uterus.

The Fallopian tube (fig. 231, B) is contained in the anterior margin of the broad ligament. It extends from the ovary to the extremity of the horn of the uterus. It is 8 or 9 inches long, very tortuous, and through it the eggs are conducted from the ovary or egg-forming gland to the uterus. The uterine extremity of the tube opens into the uterus by a

minute aperture scarcely larger than an ordinary pinhole. The other end opens into the abdominal cavity, and is attached by about $\frac{1}{2}$ inch of its circumference to the ovary (fig. 231). It is trumpet-shaped and surrounded by a fringe of mucous membrane, from which it has been called the "fimbriated extremity".

The Ovary (fig. 231, F) is oval in form and laterally compressed, pale pink in colour, and weighs about 3 ounces. It hangs in the abdominal cavity, suspended in a special pouch from the internal layer of the broad ligament; its surface is usually very uneven, from the bulging of small

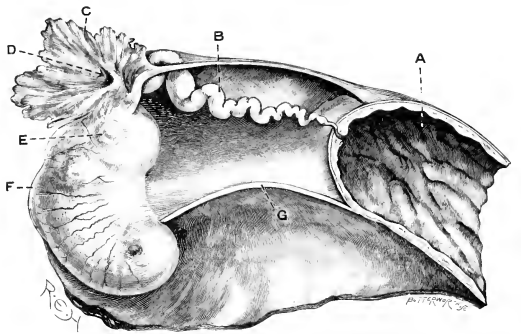


Fig. 231.—Fallopian Tube connecting the Uterus with the Ovary

A, Uterus. B, Fallopian Tube. C, Its Fimbriated extremity. D, Opening into the Tube, through which the Ovum or Egg E, passes from the Ovary F. G, Round Ligament of the Ovary.

cysts, and is scarred here and there, marking the points at which other cysts have come and gone. It has two curvatures; the greater or convex border is turned upwards and somewhat backwards, and the lesser curvature or "hilum" looks downward and a little forward. This is the attached part and receives the blood-vessels, &c. The two extremities or poles are anterior and posterior; the former gives attachment to the Fallopian tube while the latter is connected with the *ovarian ligament*. This ligament, composed of fibrous tissue and unstriated muscle, extends from the free extremity of the horn of the uterus to the ovary, and occupies the internal of the two layers which form the anterior margin of the broad ligament.

The essential portion of the gland consists of small bladder-like bodies termed "Graafian follicles" or ovisacs (fig. 232, E, G). These, when fully developed, are filled with fluid and contain the eggs. A young Graafian

follicle consists of a spherical cell, the ovum, closely invested by a single layer of epithelium; these may be seen forming an almost continuous layer near the surface of the ovary. In the deeper parts of the gland, that is to say nearer the hilum, the more developed and larger follicles will be noticed.

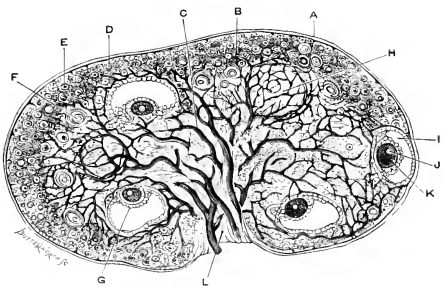


Fig. 232.—The Ovary

A, Peritoneal Coat. B, D, F, F, Cortical Vesicles. C, Blood-vessels. G, Graafian Follicle. H, Stroma. I, Graafian Follicle. J, Germinal Spot. K, Germinal Vesicle. L, Attached border.

The fully developed or ripe follicles (size about $\frac{1}{5}$ inch) are surrounded by a fibrous wall, the "tunica fibrosa", containing a capillary plexus. This is lined by several layers of epithelium, "tunica granulosa", which in one part is elevated into a little mound, "discus proligerus", in which the ovum is embedded; the rest of the cavity, by far the greater part, is filled with an albuminous fluid, "liquor folliculi". Pathological cysts are frequently seen in the ovaries, especially of cows and mares, varying in size from small marbles to oranges. These arise in the corpora lutea, and are not to be mistaken for the Graafian follicles.

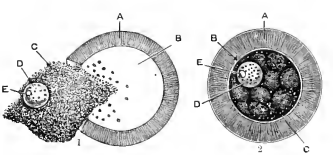


Fig. 233.—The Ovum

1, Ovum ruptured. 2, Entire ovum. A, Zona Pellucida. B, Space left by retraction of Yolk. C, Vitellus or Yolk. D, Germinal Vesicle. E, Germinal Spot.

The Ovum.—This is a spherical cell, just visible to the naked eye (about $\frac{1}{120}$ inch), composed of the following parts:—A transparent finely striated outer investment, the "zona pellucida"; within this is the "vitellus", or "yolk", made up of albuminous and fatty granules consti-

tuting the greater part of the contents of the cell. Embedded in the yolk, generally near the circumference, is a large spherical nucleus, the "germinal vesicle", within which is a nucleolus or "germinal spot". When fully developed, or ripe, the Graafian follicles project from the surface of the ovary, and sooner or later burst, at which time the ovum enters the Fallopian tube and is conveyed to the uterus, where, if fertilized by the male element, it develops into a fœtus. Should fertilization not take place then, the egg dies and undergoes disintegration.

The small cavity in the substance of the ovary, from which the egg has been discharged, becomes filled with blood, which ultimately disappears and is succeeded by a small quantity of fibro-gelatinous matter, the "corpus luteum".

Should pregnancy follow the discharge of the ovum, the corpus luteum becomes much larger, and the changes occurring in it go on much more slowly, so that it persists for a longer time.

DISEASES OF THE ORGANS OF REPRODUCTION OF THE HORSE

The male organs of reproduction are not so frequently the seat of disease as those of digestion or of respiration, but it should be remembered that the comparative immunity enjoyed by our horses, employed both for work and for pleasure, is largely due to the fact that geldings are chiefly in use for the purposes named.

The stud animal is liable both to disease and injury to an extent only realized by those in intimate association with this class of horse.

The artificial methods of feeding adopted by the generality of owners of stallions renders their charges the more prone to inflammatory diseases, and to this may be added the excitement and abuse incidental to the service season, when each popular sire may be called upon to copulate several times daily for a period of weeks.

At rare intervals in this country, but not infrequently upon the continent of Europe, a malady prevails among breeding animals of a distinctly contagious nature. It is known as *maladie du coit*, and is transmitted from mare to horse and from horse to mare in the act of coition. It sometimes becomes endemic, and may be the means of provoking abortion.

A specific bacillus of abortion has been made out by Bang with regard to bovines, and it is more than probable that some such deleterious organism will be discovered to affect the mare.

While emasculation necessarily reduces the liability to disease in the

organs of reproduction, there are troubles connected with the appendages of the penis which are directly attributable to the diminished function of that organ.

PHYMOSIS, OR ENCLOSURE OF THE PENIS

In this condition the penis becomes enclosed within the sheath, and incapable of being protruded. In new-born colts it is not due to any disease or contraction of the sheath, or enlargement of the penis, but to the folding back of the organ itself. Here interruption to the discharge of urine results in overdistention of the bladder, when the young creature is prompted to posture for urination in the manner adopted by adults, but, being unable to obtain relief, the attendant's notice is attracted to the difficulty under which the colt is labouring.

Phymosis in the adult horse or gelding arises from other causes, among which may be named: external injuries such as occur from the kicks of other animals, blows in jumping timber, or travelling through brush and scrub, accidental or surgical wounds, as a sequel to castration, the existence of an abscess, of warts, tumours of various kinds, or swelling of the penis itself from venereal and other diseases.

From the time of castration the penis of the gelding makes but little growth, and it has been observed that it actually wastes if the operation is performed while adolescent. In the emasculated animal protrusion of the penis is neither so frequent nor complete as in the stallion, and, as a result, the sebaceous secretion, which in the entire horse affords a suitable lubricant to the organ, becomes thick and unhealthy in character, and accumulates in hard, black, irregular masses. It, moreover, mechanically irritates the sheath and parts enclosed in it, thus preventing its withdrawal, and causing at the same time interference with the discharge of urine.

Geldings, more particularly those of the heavy draught breeds, when well fed and insufficiently exercised, are predisposed to swelling of the sheath, which in many instances is excited by the accumulation of the secretion above alluded to within the folds of the integument. Horses at grass are sometimes stung by insects upon which they have lain, and the resulting tumefaction of the sheath interferes with or altogether precludes the extrusion of the penis.

Symptoms.—Swelling of the parts is invariably such as to attract early attention. The other symptoms will depend upon the cause out of which the disease arises. In some cases, where the enlargement is gradually progressive, there is but little pain, but in cases of sudden occurrence, with rapid swelling, there may be sudden uneasiness shown by frequent attempts

to stale, great heat, tenderness of the parts, looking back at the flanks, and a frequent shifting of the hind limbs.

Treatment.—In the case of the new-born foal no other assistance is required than that of bringing the organ into line. It is best accomplished by introducing an oiled finger into the sheath; and to facilitate the future outward passage of the penis, some vaseline or other suitable unguent should be smeared over it.

It has been shown that the causes are various. The treatment will also vary. Inflammatory action and consequent swelling will best be combated with fomentations, anodyne ointments, and perhaps an aperient or diuretic. Warts and other excrescences may require to be removed and the œdematous sheath scarified (see Operations). In some of the latter cases a course of tonic medicine is advisable. Stings should be removed, if discoverable, and an alkaline lotion applied at the point of their introduction. In the great majority of cases the remedy will be found in a careful cleansing of the interior of the sheath.

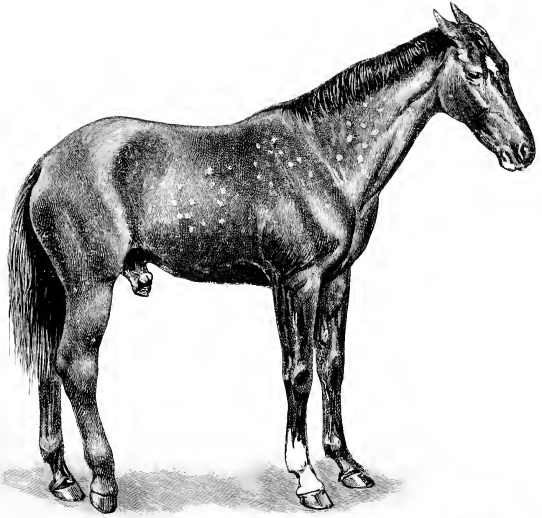
In large animals it is a work of some magnitude, owing to the extent and capacity of the sheath and the great accumulation possible within it. The most effectual manner of performing this disagreeable operation is to first introduce a quantity of vaseline, and allow an hour or so for it to become incorporated with the offensive secretion to be removed. Next introduce the hand and bring away, in small quantities, all that can be obtained, wash out with warm water in which some soap-powder has been dissolved, dry with a cloth, and finally inunct with pure lard. Nor should the operator's attention be confined to the inside of the sheath. Many simple cases are much relieved by outward application and such means as will cause the tense skin to stretch and the congested vessels beneath to resume again their normal functions.

PARAPHYMOSIS

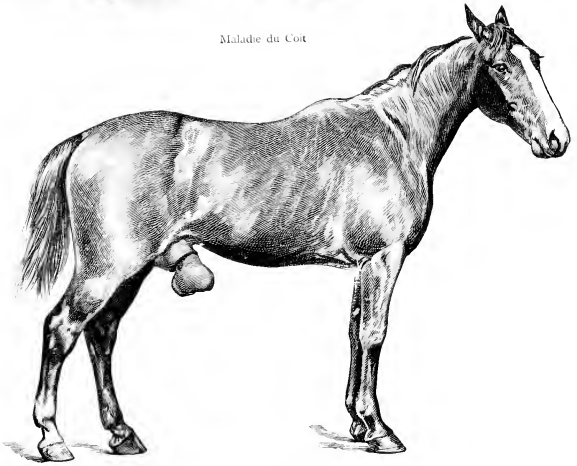
This condition is the opposite of that described above, and consists in the horse's inability to withdraw the extended penis within the sheath.

The causes are excessive debility, from poverty, old age, or illness, which occasion effusion into and swelling of the glans penis. Chronic enlargement or morbid growths either upon or within the organ itself or the sheath, the descent of calculi into the urethral canal, paralysis of the penis, injuries, and inflammation resulting from the sexual relation are also causes of this form of the disease.

The symptoms are unmistakable, the penis protrudes from its sheath and is much enlarged, the envelopes of the organ are sometimes swollen to such



Maladie du Coit



Paraphymosis

DISEASES OF THE MALE ORGANS OF REPRODUCTION

an extent as to grip and strangulate it (Plate XXXV). As a result the swelling is much increased, and unless speedy relief is afforded acute inflammation results. Then the part becomes much discoloured, at first red and painful, changing later to a deep purple. At this time it is tense and cold to the touch, and the morbid sensibility is considerably diminished. In this condition there is danger of mortification unless the strangulation is relieved and the circulation in the part restored.

Great pain usually accompanies this more advanced condition, and the horse is restless, wears a haggard countenance, rapidly loses flesh, and may die of gangrene unless speedy relief is obtained. There is a chronic paraphymosis due to paralysis, and not accompanied with the pain and excessive enlargement above mentioned.

Treatment.—Where it is ascertained that debility is the chief factor, attention to the general health will be most needful, tonics of the mineral class being indicated.

Efforts should be made to return the organ by gentle manipulation and lubrication of the parts with warm olive oil or other simple emollient, but before this is done the penis and its sheath should be thoroughly washed with soap and water. Cold lotions are also recommended as tending to rapid contraction of the erectile tissue.

In acute cases, however, such simple palliative measures are not enough. We may have to scarify the penis and envelop it in poultices. Where the enlargement is considerable it must be suspended in order to relieve the overstretched vessels and facilitate circulation. For this purpose a piece of strong flannel connected at each corner by tapes will be required as for Orchitis.

If exercise can be given, without too much motion of the pendulous and painful organ, it is desirable, as removing venous engorgement and promoting absorption of the effused fluid.

Morbid growths must be removed by operation, and in the event of occlusion of the canal from the descent of calculi or presence of foreign bodies, efforts must be made to dislodge or cut down upon them. Amputation in paralysis, and in cases of cancerous enlargement or warty growths on the glans, is sometimes resorted to, and in the majority of instances with success.

ŒDEMA OF THE SHEATH

Œdema of the sheath is a form of local dropsy in which the tissues of the part become soaked with fluid, and consequently swollen. The fluid consists of the watery constituents of the blood which have escaped from the blood-vessels as the result of weakness.

An œdematous or dropsical condition of the sheath is so common a symptom in debilitating diseases as to call for little remark from those in attendance upon horses. It follows upon pulmonary and abdominal affections, specific diseases affecting various organs, as the result of anæmia, of heart failure, organic disease of the liver, accidental injury, surgical operations, bad and insufficient food, and old age.

An acute form is sometimes traceable to blows and kicks from bad-tempered attendants, and the swelling resulting from such violence leads to a very painful condition and difficulties in connection with urination.

The more frequent form of œdema of the sheath met with in working horses is that due to languid circulation, or to the presence of an accumulation of sebaceous material in the folds of skin within.

The symptoms are too obvious to call for description, save for the purpose of distinguishing between the simple swelling due to effusion of fluid and the more serious condition of painful and enlarged sheath, which has been described under the heading of phymosis or of paraphymosis. In simple œdema of the sheath the skin is found to pit on pressure of the finger, and the animal does not shrink as if in pain. The inflamed sheath is highly sensitive to manipulation and the skin tense and somewhat hard, and does not, as in the more simple form of the affection, leave a temporary dimple when pressed.

Treatment.—Constitutional measures are generally called for, and the remedies accepted as most suitable, where debility or feeble circulation is the cause, are those of the tonic and diuretic class in combination; as, for instance, iron and gentian, with nitrate of potash, or terebinthinous substances, as the so-called Venice turpentine, resin, soap, &c. Small doses of aloes, antimonials, and other drugs which act upon the skin and kidneys are found to remove the fluid, while exercise alone will often have that effect. The abuse of diuretic medicines, in the hands of carters and others, finally renders the animal incapable of doing without them, and it is often only discovered when horses change hands.

The inside of the sheath should be explored by the hand, and accumulations of so-called "cod-wax" removed.

The parts should be liberally dressed, within and without, with lard or vaseline, as it is often found to assist greatly in relieving inconvenience to the animal in the passing of urine, besides having a decidedly curative effect.

PARALYSIS OF THE PENIS

Protrusion of the penis from the sheath, with loss of power to draw it back again, sometimes arises from paralysis of the muscle by which it is retracted.

Inability to withdraw the organ into the prepuce not infrequently results from a constriction of the inner folds of the sheath following upon injury or disease, but cases have occurred in the experience of the writer where no such condition existed to account for the morbid state, and he is forced to the conclusion that paralysis of the part referred to was the result of loss of nervous power.

These cases are more especially found in stallions of the heavier breeds.

As to the particular cause by which the mishap is brought about we have no explanation to offer. It is not necessarily associated with paralysis of the muscles of locomotion; the desire for service still remains, but a full and competent erection cannot be effected.

Such treatment as is usually resorted to, viz.: blisters to the spine, the administration of the salts of iodine, strychnine and iron tonics, have not been attended with benefit.

Where the protrusion is considerable and unsightly, removal of the organ by means of an operation is the only remedy.

AMPUTATION OF THE PENIS

This is not so difficult or so dangerous an operation as it might at first appear.

Various more or less complicated methods have been suggested, but experience has taught us that the greatest success attends the more simple forms of procedure. As the operation is a painful one it is desirable that chloroform should be first administered. The organ and the sheath should then be thoroughly washed with soap and water, and disinfected with carbolic solution. A ligature of tape is now applied round the neck of the penis immediately behind the glans, and another of strong cord higher up, above the point of incision. The body of the organ may now be divided either with a sharp knife or the écraseur; if with the knife, the cut surface should be cauterized with the hot iron, and the large vessels which run along the upper border of the organ should be ligatured with strong silk.

If the écraseur is employed, cauterization will not necessarily be required. Should bleeding follow the operation cold water is to be applied to the sheath and region of the groin and a cold wet cloth to the loins.

ORCHITIS, OR INFLAMMATION OF THE TESTICLES

Inflammation of the glandular substance whose office it is to secrete semen.

The causes are usually to be found in external violence, inflicted at the time of "service" by kicks, blows, and misdirected efforts in leaping; excessive intercourse, and over-stimulation by artificial food and administration of drugs with a view to exciting the sexual instinct. The disease may involve only one, or both organs.

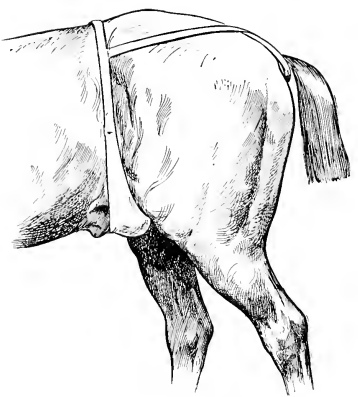


Fig. 234.—Orchitis—Testicle Suspended

Symptoms.—A painful swelling of the injured gland, enlargement of the scrotum, a tense glistening appearance of the skin, excessive tenderness to the touch, febrile disturbance resulting in loss of appetite, dulness and depression, straddling gait, pain in the region of the loins, and frequent raising of the hind-legs. In some cases abscesses form in the structure of the gland, and ultimately destroy it as a functionizing organ. There are others in which such great violence has been suffered that a portion of the investing membranes and of the common integument are destroyed and eventually slough away. The testicle in this case becomes exposed, in some instances necessitating removal.

Treatment consists in adopting such antiphlogistic measures as will most rapidly ensure reduction of the inflammatory condition of the gland. Assuming that in the majority of animals high feeding has been the rule, it will be prudent to prepare for and administer a bold dose of aloes. The diseased testicle should be slung and the whole scrotum surrounded by a poultice (fig. 234). Some entire horses are not under sufficient control to enable the attendants to do this, but every effort should be made to carry it out. Antiseptic lotions, containing some cooling and sedative agents, may be syringed upon the parts in animals not otherwise approachable. Great relief will be afforded by the administration of warm

sedative enemas three or four times a day, and by the application of warm cloths over the loins.

The food should be of a laxative nature, and may further be used as a vehicle for such febrifuges as nitrate or bicarbonate of potash or soda. In the milder cases brief and gentle exercise should be enjoined, and if the recumbent posture is unobtainable, owing to the pressure and consequent pain, the patient will derive some benefit from slings, which must be attached in such a manner as to ensure their not slipping backwards and coming in contact with the suffering members.

DISEASES OF THE ORGANS OF REPRODUCTION IN THE FEMALE

These are not of such frequent occurrence in the mare as among some other domesticated animals, but are usually of serious import.

UTERINE HEMORRHAGE OR FLOODING

This accident is less often encountered among quadrupeds than among bipeds, owing chiefly to structural differences which need not here be specified, and also to the erect posture of the latter favouring gravitation and the continuance of bleeding. Against this the horizontal position of the womb in the former is conducive to the formation of clots and the natural arrest of hemorrhage.

In the mare, alarming cases of flooding are sometimes met with, and, whether due to the accidental rupture of blood-vessels in the act of parturition, to natural weakness of the walls of the uterus, or to anatomical peculiarities, call for immediate attention. Flooding may occur after premature labour or abortion, easy and natural births, or in presentations necessitating manual interference in delivery. Among the more frequent causes, perhaps, may be mentioned the entanglement of the fœtal envelopes in the passage during delivery, when they are torn away from their uterine connections before the time has arrived when, in the absence of the foal, such contraction of the womb can be effected as shall close the mouths of the broken vessels. The experienced accoucheur will gently separate the membranes if he finds them retarding delivery; but, as has been pointed out, labour is so sudden and brief in the mare, as a rule, that powerful expulsive efforts may have already done mischief in the absence for only a few minutes of a watchful attendant. It has been observed among human obstetricians that *post partum* hemorrhage is frequent or otherwise in proportion to the rapidity of delivery, and we might, *pari passu*, look

for flooding in mares more often than among other domesticated animals which occupy more time in parturition. This, however, is not the case.

The period occupied in delivery would seem to determine the disposition to hemorrhage, whether by unaided expulsive efforts on the part of the animal or by artificial interference. The previous state of health of the mare is a factor doubtless to be reckoned with, as it will be obvious that the vessels of a debilitated animal will have less power of contraction than those of a more healthy and robust constitution. Predisposition to hemorrhage is also due in some cases to congenital weakness of the uterine mucous membrane and to injuries sustained in previous difficult labours.

Symptoms.—Persons without experience of brood mares might assume that uterine hemorrhage would necessarily be attended with an immediate discharge of blood *per vulvam*, but this is far from being the case, for the uterus in its dilated condition may continue to retain it for some time and in large amount without any outward appearance of its presence. Where this is so the more frequent signs are those of trembling, coldness of the surface and extremities, pallor of the visible membranes, a quick but feeble pulse, interrupted heart-beats, and throbbings of that organ, followed by anxiety of countenance, staggering gait, sighing, and inability to maintain a standing attitude. Cold perspiration and muscular tremors invariably appear before the animal finally sinks upon the ground and dies in convulsions.

Treatment.—To arrest the blood-flow and sustain the vital powers must be our first care. The placenta or after-birth is to be removed, for its presence is a hindrance to that contraction of the womb which is so necessary a sequel to parturition. The mere fact of its removal will in many instances bring about the desired effect, but undue force in effecting this is to be deprecated, and the expert in such matters will strive to remove the placenta by the gentlest traction, while leaving no portion of the viscus unexplored. Experienced veterinary obstetrists recommend the introduction of the hand into the uterine cavity, as its presence and gentle movement over the mucous membrane excites the organ to contract, thereby closing the broken vessels. It is important that the organ should be freed from clots of blood, which might otherwise decompose and lead to septic conditions. The accoucheur is here confronted with a difficulty, since he must interfere with nature's ordinary method of arresting hemorrhage by removing the clot, or risk the development of pathogenic organisms and the consequences they entail. The practice of introducing cold water, or a sponge saturated with it, has sometimes proved effectual in arresting uterine bleeding, and on the other hand very hot water has been advocated by some as a styptic agent. Neither the hand nor any medicinal substance should be inserted, with a view to arrest hemorrhage, without employing

some antiseptic (see Antiseptics), and regard must be had to the composition of any drug subsequently employed, or some chemical decomposition may neutralize the effects of the agents used. For example, the mistake is often made of employing permanganate of potash as an antiseptic and glycerine as an emollient, the two being incompatible.

A solution of chinosol in the proportion of one in six hundred is very suitable for irrigating the womb or for saturating the sponge, if it is decided to introduce one. In severe cases, where collapse is feared, the stronger styptic of perchloride of iron or somewhat dilute vinegar may be substituted for cold-water injections. Solutions of tannic acid, or glycerine-of-tannic acid (where permanganate or Condy's fluid has not been used), or of witch hazel should be used. The latter being held in great esteem for the purpose in America.

It may be advisable, while these measures are proceeding, to apply cold douches over the loins, at which time a small dose of some alcoholic stimulant should be given. It will be desirable also to give, in the form of draught or ball, one or more of those internal stypties which act through the medium of the circulation: gallic acid, salts of lead, morphia, tincture of iron, ergot of rye, &c. Of the remedies last named, ergot is perhaps of least value in mares, and the fact is mentioned because it is a drug so highly valued in human medical practice. Should we fail with the remedies above named, we have still left a class elsewhere described as revulsives, in the shape of mustard cataplasms, which may be applied over the region of the loins and upon the hollows of the flanks. Vigorous rubbing and hot bandages should be applied to the legs, and plenty of clothing to the body.

There should be no attempt to counteract febrile symptoms, that may subsequently develop, by purgative medicines, but rest should be secured for the organs recently involved in what should always be regarded as a serious mishap. Some bicarbonate of potash may be given in the drinking-water, and the diet should be gently laxative during convalescence, linseed forming an important item in the menu (see Nursing and Feeding of the Sick).

INFLAMMATION OF THE WOMB

Inflammation of the womb is technically known as Metritis, and distinctions are drawn between endo-metritis and metro-peritonitis, the former affecting chiefly the internal layers of the uterus, while the latter includes the investing peritoneal membrane common to all the abdominal organs. At all times a serious sequel to parturition, it is the more feared from the

frequency with which septic organisms enter the blood-stream and induce parturient fever.

There is an acute form, running its course very rapidly, a subacute of less intensity and of somewhat longer duration, while a third or chronic inflammation of the womb is occasionally encountered, in which the ordinary symptoms are not marked, but a state of debility follows, with irregularities of œstrum which will be more particularly alluded to in a subsequent paragraph.

The cause is usually to be found in some abnormal presentment of the fœtus, and the difficulties connected with delivery, but that there are others less obvious may be assumed from the fact that the malady is discovered in mares which have passed through the crisis of parturition without any serious obstacle or apparent trouble.

Lactation may be satisfactory, the maternal solicitude fully awakened, and nothing to indicate a departure from health during the first twenty to forty hours—a rigor indicating approaching inflammation being rare before the latter part of the second day, although, according to some observers, it may be postponed until after the eighth. Shivering (rigor), staring coat, diminished appetite, and a more or less gradual suppression of milk, with a pulse increased in frequency but diminished in force. Other attractive symptoms are shallow and hurried respiration, a rise of two or more degrees of temperature, a pasty condition of the mouth, redness and swelling of the visible membranes, and coldness of some of the extremities. In the acute form of the malady abdominal pain is indicated by whisking of the tail, looking uneasily round at the flanks, and in some instances striking at the belly with a hind-foot.

The lameness noted by some observers would appear to arise more from pain accompanying movement of the body than from any actual disorder of the limb, but there are undoubted cramps affecting the muscles of the haunch and simulating paralysis. In the more severe cases patches of sweat appear on the quarter, the animal is indisposed to lie down, as in some other affections where the recumbent posture either adds to pain or induces fear of inability to regain the feet. There is a disposition to stand persistently with arched back, and an objection to movement suggestive of laminitis, which is by no means a rare sequel. The womb is often distended with fluid, which can be felt from outside the flank of a thin mare, and finds escape in variable quantities from the genital orifice as a thin, serous, yellowish or dark-red discharge. The lips of the vagina may be tumefied in sympathy with the womb, or as the result of injury in the act of parturition.

Where the peritoneum has suffered by extension of the inflammation

from the uterus (metro-peritonitis) there is serous effusion into the cavity of the abdomen, with more or less enlargement and increased roundness, the presence of abnormal fluid being ascertained by percussion of the flanks and the absence of resonance in the lower portion of the belly. A few days, rarely exceeding five, will see a termination in death, unless a healthy reaction is rapidly followed by recovery.

In a few instances the disease passes into the chronic form, there is a considerable abatement of the symptoms, less pain, increased appetite, the enlargement of the vulva is not so noticeable, but the discharge persists and the milk does not return. There is continued debility and probable wasting of the body generally, while a false œstrum occurs at irregular intervals.

Treatment consists in irrigating the uterus with antiseptics, emollients, and anodynes, while sustaining the patient's strength with nutritive and easily-digested foods of a laxative character, and otherwise guarding against constipation and keeping down febrile symptoms by the administration of salines, salicylates, and other agents which are more particularly described under the heading "Parturient Fever".

VAGINITIS

By this term is understood an inflammatory condition of the passage through which the fœtus has to pass after leaving the uterus. While commonly associated with metritis, or inflammation of the womb, it may arise independently, as from mechanical difficulties in delivery and the use of obstetric instruments, exerting undue pressure, or actual wounding; from protracted labours or abnormally large offspring. It may be simple and remediable, or associated with lacerated wounds, ulcers, gangrene, and mortification.

The symptoms consist of tumefaction of the lips of the vagina, bulging of the region immediately below, swelling of the mucous membrane lining the canal, with discoloration varying from bright red to purple or almost black, with wounds and abrasions, commonly the latter, and of a superficial character, but not rarely of a serious description, where undue force has been employed in the extraction of the fœtus. The membrane is dry, of a florid red hue, adhesive, and hot. A difficulty is experienced in passing urine, there is often much itching of the labia, a general febrile condition and constipation, which latter would seem to have its origin, at least in part, in deferred defecation arising out of the pain induced by the act.

On the second or third day the congested, dry condition of the membrane gives place to a somewhat profuse secretion, which is at first serous,

occasionally blood-stained, and, as time passes, takes on a muco-purulent character, with such acrid qualities as to excoriate the skin over which it passes, and denude the parts of hair.

Treatment.—Simple vaginitis will often pass away without treatment in the course of a few days, but its appearance should never be lightly regarded, since it may become troublesome, if not serious. A gangrenous ulcer may be the source of infective inflammation of the adjacent parts, or the entrance through which septic germs may pass to cause parturient fever. Patches of membrane sometimes slough away, with the result that the passage of the vagina becomes contracted, and parturition is rendered difficult on subsequent occasions.

Treatment consists in antiseptic measures, as careful sponging of the exposed parts with a solution of carbolic acid, or other disinfectant, with glycerine as an emollient, and repeated injection of the same. Measures of this kind are usually successful in the early stages, provided there are no complications in the shape of wounds, but agents of a more astringent description may be called for if breaches in the walls of the canal are discovered. A lotion consisting of exsiccated or so-called "burnt" alum has been found valuable both as an astringent for ulcerated wounds and an antiseptic where a fœtid discharge persists. At the outset a dose of aperient medicine should be administered and a bran diet prescribed.

Neglected vaginitis may result in

LEUCORRHŒA

This is a more or less chronic discharge from the vagina. From its frequently white, viscid nature it is known among studsmen as "the whites", and as having its analogue in the human subject, passing under the same name. When white and glutinous in consistence it is also inodorous. In some instances it is of a sanious, fœtid, purulent description, and particularly evil-smelling, and the skin is found excoriated where the matter has fallen upon it.

Anyone who is not in constant attendance upon a mare thus affected may be led into the error of supposing the malady has disappeared because the discharge is not observable while the standing posture is maintained. In some cases it is more especially noticeable when the creature has occasion to micturate, or when lying down gravitation favours its backward discharge.

When leucorrhœa has settled into a chronic form there is seldom much constitutional disturbance, but it is not consistent with a high level of

health, and interferes with reproduction by irregular and imperfect œstra, uncertain behaviour towards the male, and frequent failure of service. The secretion of milk is diminished in proportion to the continuation and profuse nature of the discharge, and though the appetite may be maintained, there is some loss of flesh and condition. To discover the parts most implicated resort is had to an instrument known as the vaginascope (fig. 235).

The lining membrane of the canal is pallid, relaxed, and comparatively insensitive to the touch. This applies more especially to the vagina, from which there is a white, thick inodorous discharge, while in others a red, swollen membrane may also display a rough granulated surface. The os uteri fails to contract to its normal proportions, and the womb remains more or less flaccid.

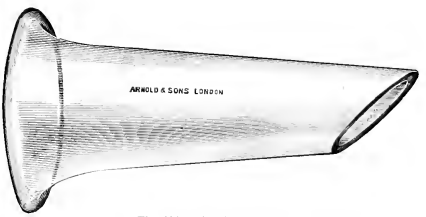


Fig. 235.—The Vaginascope

Treatment. — Thorough cleansing within and without, disinfection and removal of dried adherent matter from under and around the tail and hind-quarters, the injection of astringent agents, and the administration of mineral tonics. For the first-named purpose a solution of carbolic soap will prove suitable, for the second a weak solution of sulphate of zinc, or permanganate of soda, iodoform, or lysol. For the last the sulphate of iron and copper enjoy a high reputation, combined, maybe, with some vegetable bitter, as gentian root or cinchona.

A liberal diet, with a paddock for exercise and a hovel for rest, are conditions which the prudent horseman will certainly provide.

MAMMITIS

The importance of the udder cannot well be exaggerated. Upon its integrity and efficiency depends the life of the foal in nearly all cases, foster mothers being difficult to procure, and milk substitutes unsatisfactory. In the chapter dealing with the generative functions, with pregnancy, and parturition the changes wrought in the mammary glands previous to giving birth to young are described, and should render the following remarks on mammitis more intelligible. It is permissible, perhaps, to

say here that previous to the foal's birth the mammæ enlarge, become more dense, pendulous, and vascular; the teats undergo development, enlargement, distension; the last sign of approaching parturition being the formation of semi-transparent pendulous bodies which attach to their orifices, and are familiarly known as the "wax".

At the time of parturition the udder, which, it will be remembered, is divided into two sections commonly called quarters, is filled with milk ready for the new-comer. Though the development be normal there is increased temperature and sensibility of the mammæ: a natural or physiological engorgement as distinguished from a pathological one. There may be discomfort, amounting to pain even, with the former state, and its importance will be appreciated when it is remembered that impatient mares endanger the life of the young by refusing them permission to suck; nay, more, inflict fatal injuries, not infrequently, upon the foal, while exercising its instinct to "bunt" an udder which does not freely yield nutriment. There are great differences in the temperament of mares, a subject upon which one is tempted to enlarge, but this is not the time or place; suffice it to say that some will endure a good deal of pain in the interest of their young, while in others, notably very young mothers, maternal affection is sometimes almost entirely wanting.

Causes.—A hyperæmic or congested condition of the mammæ at the time of parturition, or for some days previous to that act, is common, and among experienced breeders and veterinarians it is a moot question whether or no such congestion should not in some cases be mechanically relieved by hand-milking. That the tense and painful state of the glands constitute a danger to both parent and offspring is generally conceded, and the propriety, or otherwise, of manual interference is a question upon which no hard-and-fast rule can be laid. While it has to be borne in mind that the first milk secreted contains a valuable laxative principle (calostrum), of which the foal should partake, a substitute may be obtained where the relief of the engorged mammæ is of paramount importance.

Mammitis is due to over-repletion with milk, injuries, lying upon cold wet ground, exposure to east winds, to obstruction of the ducts within the udder, or impervious teats, and in some instances it is believed to be the result of imperfect circulation in the great posterior vena cava.

The symptoms of engorgement and actual inflammation of the udder may be considered together, as the former is not immediately distinguishable from the latter and is in the majority of cases its precursor. When due to over-repletion the malady is gradual in its manifestation. If arising from external violence, inflammation is suddenly developed, the affected parts being swollen, tense, hard, and showing a want of elasticity on manipulation.

In the case of simple congestion sensibility to the touch is not very marked, and the impression of the finger will not be left upon the enlarged gland, showing the absence of inflammatory effusion. Bodily temperature is not appreciably affected, nor is the appetite impaired.

Where actual inflammation exists, the skin of the affected quarter is very tense and shining, the teat greatly enlarged, and if much redness is not seen it is because the skin of this part is commonly very dark in colour. The implicated quarter pits on pressure of the finger, owing to a superficial infiltration of the tissues with fluid exudation. The base of the teat communicates a feeling as of clots or coagula, the presence of which may be confirmed by drawing the teat, or by the introduction of a teat-syphon, when a more or less blood-stained fluid is discovered, containing granulated masses of clotted milk. Pus cells, calostrum, and broken-down epithelium will be found floating in the watery fluid which makes up the bulk of the material coming from an inflamed quarter. In contradistinction to the simple state of congestion above referred to there is more or less constitutional disturbance, the temperature rises considerably, the appetite is somewhat impaired, and there is much local pain. With good management and prompt treatment the gland may be restored in the course of a few days, and the secretion of milk re-established gradually.

Failing success by simple measures, to be presently alluded to, the function of the quarter may be arrested for the season and remain predisposed to a similar attack after birth of another foal. A degraded secretion, composed of part milk, and some pus, serum, &c., may continue, but the formation of an abscess is not so likely to occur as when the inflammation runs high and the teat is altogether occluded from the first by solid matter. Instead of the formation of pus, and the gradual pointing of an abscess, it sometimes happens, especially where the origin was external violence, that the whole quarter dies. Its sensibility is gradually lost, it becomes cold, a line of demarcation is observed between the living and dead or dying tissue, and recovery is only possible by the casting off (sloughing) of this gangrenous portion. It need hardly be said that a mare which has lost a quarter should never be put to the stud again.

The terminations of mammitis may be briefly described as resolution or a return of the organ to a normal condition, induration or hardening, atrophy or wasting, gangrene or death of the gland, or the succumbing of the mare herself to the ravages of the disease.

Treatment.—The early adoption of remedial measures is of the utmost importance, as in acute cases changes of structure of a permanent and unalterable character take place during the first few days of the malady.

Simple engorgement may be relieved by milking with the finger and thumb, an operation requiring some little practice to be efficiently performed, and not necessarily possessed by a good cow-milker. No great quantity is obtainable at one time; the operator must be content to repeat the performance several times during each day if much benefit is to be derived. He should depend, too, upon a soothing manner and gentle manipulation rather than upon severe methods of restraint calculated to annoy the patient, whose will is capable of more or less control of the milk to be yielded.

Inunction of the udder with lard or vaseline affords relief by enabling the skin to stretch. In some cases it is necessary to employ a milk-syphon, as blocking of the teat or great tenderness at the base may render hand milking impossible. The instrument must be introduced with much care, oiling the point first and employing only the gentlest means of pushing it up into the space existing between the glandular structure and the substance of the teat. The aperture of the teat being provided with a delicate sphincter muscle, its resistance must be overcome gradually, or its capacity to contract on subsequent occasions may be impaired, or even destroyed, thus allowing the milk to escape from the gland as fast as it is secreted. The ring teat-syphon (fig. 236) can be retained in position, where desirable, by tapes attached to the rings and passed over the loins of the patient, but it is extremely liable to come out, and has in some instances caused injury when the animal has lain down.

Fig. 236.– Teat-Syphon

Where abscess commences to form in the gland it is very difficult to arrest the formation of matter, but it may be controlled in a measure by the administration of aperients and febrifuges, and the employment of mild stimulating embrocations to the udder. If the swelling becomes large, tense, and painful, with a disposition to bulge or "point" in one direction, it will be well to encourage the process by poulticing. Very great relief is afforded by opening the abscess with a lancet, but the operation should not be prematurely performed. When pus has been evacuated the abscess may be syringed out with an antiseptic lotion from time to time. The animal must be well sustained with nutritive food, but this should not be of a milk-making description in any trouble connected with the udder, the first consideration being to restrain the functional activity of the gland, allay inflammatory action, and prevent its sequelæ.

Gangrene or death of the mammæ must be treated with a view to conserving the life of the mare; since the affected organ or a large portion

of it must inevitably be lost. Our efforts should be directed to sustaining her general health, while facilitating the detachment of the destroyed gland, and rendering the adjacent parts aseptic by frequent irrigation with a solution of carbolic acid or some other disinfectant.

The further treatment of the case will consist in the administration of mineral and vegetable tonics, together with a generous diet, pure air, and such gentle exercise as her condition will permit. The gland should be frequently fomented, the sloughing portion gently detached, and strict regard given to cleanliness of the apartment occupied, particularly in respect of the bedding and floor of the box, which should be kept clean, sprinkled with a carbolic powder in cold weather, or washed with a suitable fluid disinfectant if the temperature will permit it. Anything like force in removing the slough is to be deprecated, but its detachment may be considerably hastened by judicious traction where the mass does not, by its weight, assist in detaching itself. When the greater portion of the gland has sloughed, the gaping wound left behind is very formidable looking, and the disposition to repair is quite surprising to those who see such cases for the first time, a few days sufficing to fill up the greater part of the cavity, and a month usually serving to effect complete repair of the injured structures, leaving only a cicatrix of much smaller proportions than the tyro could possibly have imagined.

While the healing process is going on, the wound should be kept perfectly clean by gentle sponging, and frequent irrigation with some antiseptic solution should be employed to guard against sepsis or blood-poisoning.

PARTURIENT FEVER

Parturient fever can hardly be considered without reference to those maladies which are its precursors, the chief of which are known as metritis, and divided by pathologists into endo-metritis, as affecting or beginning with the internal surface of the womb, and metro-peritonitis, where first the womb is affected by inflammation, which is subsequently shared by the peritoneal membrane investing it. Any difficulties connected with delivery of the fœtus which result in injury to the uterus of the mare may lead to parturient fever, as the result of absorption of septic organisms. Although injuries to the uterus exciting inflammation are mentioned above as the chief, they are not the sole causes, as the entrance into the blood-stream from any other point, as from the vagina, or possibly some muscular injury not immediately associated with the generative system, may have the like ill consequence of infecting the patient at a time when she is peculiarly susceptible to invasion.

Symptoms.—It is not always possible to distinguish at first between metritis and parturient fever and to say at what time septic influences commence, as both are accompanied with suddenly increased temperature; neither is the intensity of the febrile symptoms a particular guide, for metritis and septic poisoning alike vary in degree, and may be severe and fatal or mild and transient.

Uterine inflammation or parturient fever may supervene at an early period, commonly between the second and eighth day after parturition; but much later periods are on record in mares, these animals differing from other domesticated species in the greater length of time after which septic troubles may commence. All may for a time have gone well with the mare, lactation be satisfactory, the maternal instinct fully exercised, and no apparent reason exist for apprehension, yet a sudden and severe rigor may appear accompanied by a rise of two or more degrees of temperature in a few hours. Then follows dulness, loss of appetite, a small, hard, quick pulse, suppression of milk, reduction in the size of the mammary gland, indicating a grave condition and shortly to be followed by shallow breathing, a hot and pasty state of the mouth, deep redness of the membranes of the eyes and nose with coldness or variability of the ears and extremities. Abdominal pain, simulating colic, with its better-known symptoms of striking at the belly, looking round at the flanks, stamping the feet, getting up and down, whisking the tail, accompanied with expulsive efforts similar to those known as "after-pains", which all animals involuntarily make in ridding themselves of the placental membranes. Pain, too, is apparent in the hind limbs, taking the form of cramp and a lameness that is paralytic in character. Where parturient fever exists apart from metritic inflammation there is a greater disposition to seek a recumbent posture, the latter being found too painful when an inflamed uterus receives pressure from the abdomen resting on the ground.

Where parturient fever is a sequel to metritis there will be swelling of the vulva and a discharge from the vagina varying in character from a thin serous fluid of pale straw colour to a purplish or chocolate hue. While this is a common symptom it is not necessarily present in those cases where infection has taken place at some other part than the womb. Where fever is accompanied with metritis there is arching of the back in addition to a persistent maintenance of the standing posture, which is only relinquished at the approach of death. With metro-peritonitis there is invariably more or less effusion of serous fluid into the abdominal cavity. If abundant, the movement of fluid is perceptible when hands are placed on opposite sides of the flank and alternately and suddenly compressed.

Three or four, at the most five or six, days will witness the termination

of the malady in death in a large percentage of cases, but there has been a notable reduction in the fatality of the disease, as arising from inflammation of the uterus, since efficient irrigation of the organ with modern antiseptics has been more generally practised.

From the foregoing remarks it may be gathered that prognosis is usually unfavourable; the more so that the disease is seldom early enough recognized and professional assistance sought.

Prophylaxis.—Having regard to the causes of parturient fever, too much care cannot be exercised when assisting delivery, in order to avoid injury to the vaginal or uterine membranes by the operator's nails or instruments, such precautions being especially necessary in the removal of a dead fœtus, which may be much decomposed yet comparatively harmless while the genital passages remain uninjured and intact. The practice of passing from a post mortem examination to a case of parturition is doubtless responsible for parturient fever in some instances, and no person who has been so engaged for at least twenty-four hours previously should take part in delivering a mare, and then only after a complete change of clothing and thorough cleansing and disinfection of the hands.

No other brood mare should be permitted in the same building with an animal suffering from the disease under consideration, and the most thorough disinfection of the apartment should be undertaken at the earliest opportunity.

To remove or neutralize any septic matters in the uterus will be our first care, and this will be best effected by injections of warm solutions of such agents as carbolic acid, chinosol, lysol, or permanganate of potash in suitable proportions.

Visible wounds in the vagina, incurred in the forcible removal of the fœtus, will be dressed with some rather more active agent than that employed for injection; a one-in-ten carbolic acid and olive-oil lotion being found well adapted to the purpose.

As to the administration of remedies intended to act through the medium of the circulation, these will be chosen for their known action as antiseptics and febrifuges, diminishing the power of the poison circulating in the system, and arresting the rapid consumption of tissue which results from continued high temperature. Among the older agents enjoying a reputation in this respect may be mentioned the hyposulphites of soda and potash. Carbolic acid, deprived of its causticity by solution in glycerine and free dilution, holds a mediate position between the before-named drugs and the more recent additions to the pharmacopœia, as salycilic acid and its compounds. Large doses of quinine are perhaps more

esteemed among the new school of practitioners than any other medicinal agent for internal administration.

Where constipation is a marked symptom a mild saline aperient may be administered in the form of sulphate of soda, either given as a draught or, better, in the drinking-water. In extreme cases, where a special value has been attached to the animal, intra-venous injection of antiseptics has been practised. In the convalescent stage tonics and a liberal but easily assimilated diet is advised.

INVERSION OF THE UTERUS

To turn the uterus inside out is not an event of common occurrence in the mare. In the cow it is not only more frequently observed but it is likewise less serious in its consequences, though it is in no case free from danger to the life of the animal.

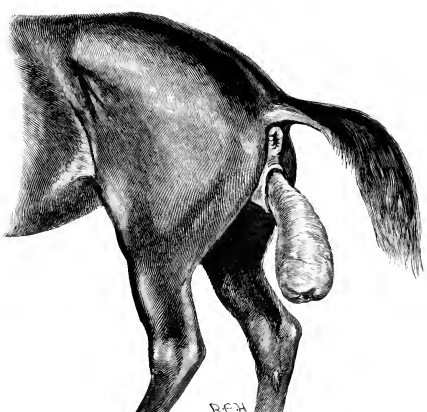


Fig. 237.—Inversion of the Uterus

Causes. — Old mares which have been long at the stud are more liable to this outward displacement of the uterus than are young ones, and the prospects of successful treatment are more favourable in the former than in the latter. The exciting cause of inversion of the uterus is excessive straining, commenced during parturition and continued after the birth of the fœtus, or the extrusion of the organ may follow immediately after delivery.

Symptoms.—After a period of violent straining, of shorter or longer duration, a fleshy-looking mass is observed to project from the vulva, and quickly to enlarge and extend downwards for a greater or less distance, depending upon the degree of displacement. Should the entire uterus

be inverted it may reach as low as the hocks. If in this condition it is allowed to hang down, the colour of the exposed membrane changes from red to purple, and may deepen to blackish red. At the same time the organ swells and the mucous membrane becomes soft and easily torn, while at the same time a bloody-looking fluid oozes from the surface. Although at first the mare displays no evidence of severe suffering, active disease in the uterus quickly appears and leads to a fatal issue, unless relief can be afforded. At this time the mare evinces pain by looking towards the flanks, pawing, and general restlessness, in which she may lie down and rise again from time to time. Should help not be at hand the face becomes pinched and anxious, cold patchy sweats appear on the body, the muscles quiver, the legs and ears are cold, the pulse quickens almost beyond numeration, the body temperature is heightened to 105° to 107° and collapse soon puts an end to the case.

Treatment.—Inversion of the uterus needs prompt professional attendance, but in saying this it is not to be understood that there is nothing for lay hands to do. On the contrary, the owner or attendants may render most valuable services pending the arrival of the expert. In this connection it is necessary they should know that so long as the uterus is allowed to hang down so long is the circulation in it being obstructed and inflammation consequently excited. The blood entering it is in a large measure prevented from leaving it, owing to its depending condition. As it accumulates, the organ swells, increases in weight, and assumes a black colour, besides which it becomes soft and foul, at best rendering its return difficult, if not impossible. Until, therefore, the veterinary surgeon arrives some attempt should be made to guard against these objectionable and dangerous conditions.

With this object an old, though clean blanket, should be procured, and being folded once and soaked in a warm solution of carbolic acid, should then be passed under the womb and raised by a couple of men standing one on each side behind the mare, until the displaced organ is brought into a straight line with the vaginal opening. By this means the weight is removed from the part by which it hangs, and the circulation is restored and facilitated. The effect of cold and exposure, which tends to cause congestion, may be guarded against by covering it over with a flannel wrung out in warm carbolized water. Failing to procure professional assistance an attempt should be made to return it. Before commencing to do so the hands of the operator should be thoroughly cleansed and dressed with carbolized oil, and should any dirt have become attached to the extruded organ it must be carefully removed by washing with warm carbolized water. The organ should also receive a dressing of carbolized oil over its

entire surface. When the uterus has become much swollen and congested it will be necessary to effect a reduction in its size before it can be returned. To do this the surface of the mucous membrane will require to be scarified, *i.e.* be pricked here and there at numerous points with the point of a clean lancet or knife and then fomented with warm carbolized water.

In commencing to put it back, that part of the organ nearest to the vaginal opening should first be pushed inward, and the part next succeeding should follow until a considerable portion has been replaced. Then, while it is still supported in position, the doubled fist should be placed against the extreme end of the extruded part, and by careful, gentle, and continued pressure the whole returned to its place. In order to obtain all the available room possible for this purpose the rectum should be emptied of feces before return is attempted.

On completion of the operation the mare will be benefited by a full dose of tincture of opium to check straining, after which she may be placed in a stall with the hind-legs underpacked with litter so as to elevate the hind parts, and a truss should be adjusted to the vaginal outlet in such a way as to prevent the escape of the viscus again.

CYSTIC DISEASE OF THE OVARY

Cystic disease of the ovary is by no means of seldom occurrence in the mare, and is no doubt the cause of many cases of sterility in this animal which may occur at any period of sexual activity.

Cystic disease may appear either as a simple dropsical dilatation of the Graafian vesicle or in the form of proliferous cysts. Of these two varieties the former is by far the most commonly met with, while the latter is most frequently the cause of dropsy of the ovary which gives so much trouble to the human female.

In some cases the disease confines itself to one cyst, which by enlarging and spreading may cause absorption of the entire organ.

In other instances two or more cysts, varying in number in different cases, develop, and in the course of their expansion are brought together, and by the forcible action and reaction of their walls one upon another cause the partitions to be broken down and the cavities to become continuous. In these cases the fusion of the cysts is generally shown by the irregularly chambered cavity which results. The whole of the ovary may thus be caused to disappear, leaving in its place a large irregular cyst. The contents of these formations is, for the most part, a thin, transparent, watery fluid containing a small quantity of albumen.

Another form of cyst is sometimes met with in the ovary and also in the testicle. This is known as a *dermoid cyst*, so called on account of its

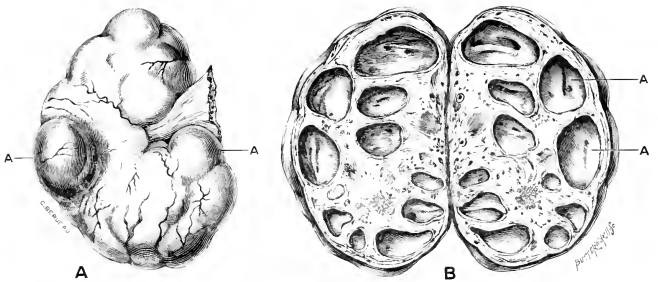


Fig. 238.—Cystic Ovary

A, The Ovary Entire. A A, Cysts distended with Fluid. B, Ovary in Section. A A, Cysts or Cavities from which Fluid has been removed.

being formed out of the elements of skin and containing one or more skin products, such as hairs, fat, teeth, &c.

These growths are considered to arise out of some error in the development of the animal in which they occur, and are essentially congenital.

There are no symptoms which will rightly guide us in a diagnosis of these affections. They seldom disturb the general health and rarely occasion death.

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11. THE EYE

ANATOMY OF THE EYE

The eye is an instrument by which light, colour, form, and movement are recognized, and by which, combined with other faculties, we acquire a knowledge of distance, relation, position, and size of objects.

It occupies the fore or outer part of the cavity named the orbit, the bones of which form a very efficient means of protection to it against injury. It rests on a soft bed of fat, which enables it to yield to direct blows, and it is further protected by a retractor muscle, which withdraws it under cover of the bones, whilst the eyelids and the membrana nictitans (haw) cover it in front. It is consequently only rarely injured. The membrana nictitans, or haw, is a triangular piece of cartilage which gradually becomes thinner from back to front. It is situated in the inner

canthus of the eye, and is attached to a cushion of fat by its posterior angle, while in front it presents a very thin edge by which small particles of dust, hairs, insects, and the like, are removed. If not swept away by the nictitating membrane, they are washed away by the copious secretion of tears which they excite from the lachrymal gland (fig. 246, E).

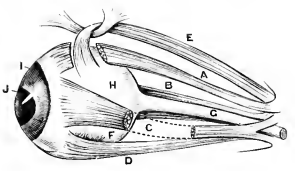


Fig. 239.—Muscles of the Eyeball

A, Superior Rectus Muscle. B, Retractor Muscle. C, External Rectus Muscle. D, Inferior Rectus Muscle. E, Superior Oblique Muscle. F, Point of Insertion of Inferior Oblique Muscle. G, Optic Nerve. H, Globe of the Eye. I, Iris. J, Pupil.

It is moved or rotated by seven muscles, viz., the four recti, or straight muscles, named respectively the superior, inferior, external, and internal rectus; the superior and inferior oblique muscles, and the retractor bulbi. The superior oblique muscle, which turns the eye downwards and outwards, is supplied by the fourth nerve or trochlearis. The external rectus is supplied by the sixth cranial nerve, and the remaining five muscles are supplied by the third nerve. These muscles, with the exception of the inferior oblique, arise from the back of the orbit, and, passing forwards, are inserted into the fore part of the globe. The inferior oblique muscle arises from the inner part of the floor of the orbit, and, running outwards and upwards, forms a kind of sling—supporting the eye together with the tendon of the superior oblique. The superior oblique (fig. 239, E), arising from the back of the orbit, ends in a tendon which runs through a small loop or pulley on the upper part of the inner wall of the orbit, and then, changing its direction, runs outwards and a little backwards, to be inserted into the upper part of the globe.

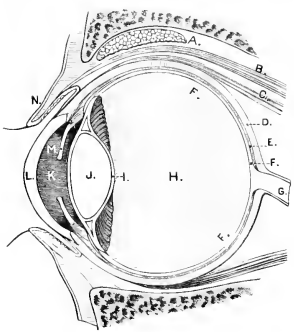


Fig. 240.—Section of Eye

A, Lachrymal Gland. B, Levator Palpebræ Superioris. C, Levator Oculi. D, Sclerotic Coat. E, Choroid Coat. F, Retina. G, Optic Nerve. H, Vitreous Humour. I, Capsule of the Lens. J, Crystalline Lens. K, Aqueous Humour. L, Cornea. M, Iris. N, Upper Eyelid.

The ancient division of the structures of the eye into three coats or tunics, and three humours, is still the most convenient for description.

The first coat is composed of the sclerotic and cornea (fig. 240, D, L).

The second coat is formed by the choroid ciliary processes and iris (fig. 240, E, M).

The third coat is the retina, or expansion of the optic nerve (fig. 240, F). The three humours are the aqueous humour (fig. 240, K), the crystalline lens (fig. 240, J), and the vitreous humour (fig. 240, H).

The outermost tunic is a dense, tough, and unyielding membrane, the inner four-fifths of which is opaque, and named the sclerotic or white of the eye, whilst the outer or front fifth is transparent, and is named the cornea or glass of the eye. The sclerotic is thick behind, where it presents a small opening for the entrance of the optic nerve (fig. 248, 1), and thinner in front, where it becomes continuous with the cornea. The fore part of the sclerotic, or that which forms the white of the eye, is covered with a delicate mucous membrane, named the conjunctiva, which is continued over the cornea as a transparent membrane composed of eight or ten layers of cells. These cells, if injured, can be thrown off and renewed, so that the transparency of the cornea is not impaired after slight lesions. Different as the aspect of the cornea is from the white or sclerotic portion of the membrane, the material out of which each is composed—connective tissue—is the same, only that in the sclerotic the fibres are irregularly arranged, whilst in the cornea they are disposed in layers or lamellæ one upon another, with many intervening branching cells which enable the nutrient fluid or plasma of the blood to penetrate and nourish the tissue. The cornea is supplied by the fifth pair of nerves, which confer upon it the exquisite sensitiveness of the surface.

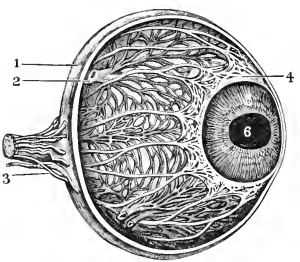


Fig. 241.—The Choroid Tunic

1, Cut Surface of Sclerotic. 2, Veins of the Choroid (Venæ Vorticosæ). 3, Ciliary Nerves and Arteries. 4, Ciliary Ligament. 5, Iris. 6, Pupil.

The Choroid Tunic is composed of a close net-work of blood-vessels, the outer layer of which is formed by the large veins of the eye known as venæ vorticosæ (fig. 241, 2). The inner layer is formed by the delicate capillary vessels disposed in loops, and is in contact with the retina. At the back part of the choroid there is a circular opening, like that in the sclerotic, for the passage of the optic nerve to the retina; in front the choroid is folded into a large number of plaits named the ciliary processes (fig. 242, c), which project into the interior of the eye behind the iris.

Numerous dark-looking pigment cells, of irregular forms, are distributed between the blood-vessels, giving to the membrane a soft, velvety-black colour, except at one part, which forms a broad band just above the entrance of the optic nerve. Here the choroid presents a metallic yellowish-green colour, and reflects the light strongly.

This appearance is attributed to the peculiar arrangement of some thin cell-plates found in this part, producing the phenomena of interference of light, and is believed to assist the animal in perceiving objects in twilight.

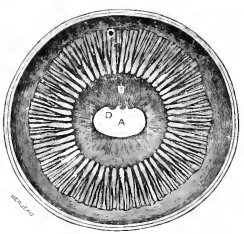


Fig. 242.—Interior View of the Eye

A, Pupil. B, Iris. C, Ciliary Processes. D, Corpora Nigra.

The Ciliary Processes (fig. 242, c), which are thickly covered with black pigment, are about one hundred and twenty in number, and are arranged in a circle, projecting into the interior of the globe to become connected with the vitreous humour. They probably play an important part in the secretion of the aqueous humour. Externally they present a whitish band, which is the ciliary body or muscle. Some of the fibres of this muscle radiate backwards from the margin of the cornea over the choroid, others are circular; both, when acting, modify the curvation of the lens, and thus influence the accommodation of the eye.

The **Iris** (fig. 241, 5) is a thin membrane composed of blood-vessels and

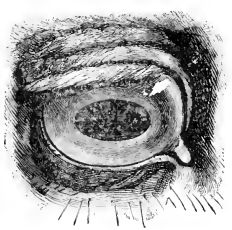


Fig. 243.—Pupil Dilated

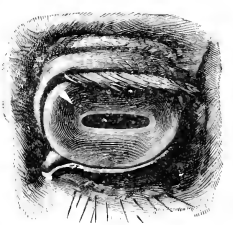


Fig. 244.—Pupil Contracted

of muscular fibres united together by connective tissue. Some of these fibres are arranged in the form of a ring around the inner margin of the pupil, while a second set, outwardly placed to these, and connected with them, are disposed in a radiating manner like the spokes of a wheel.

In the centre of the iris is an ovoid opening, the "pupil" (fig. 241, 6),

on one or both edges of which are a few small black bodies called corpora nigra (fig. 242, D). The pupil is the opening through which light enters the eye, and by which images of objects in the outer world are permitted to be formed on the retina within. The iris, except in albinos, is perfectly opaque, and acts as a diaphragm, regulating the amount of light that enters the eye. In dim lights the pupil dilates (fig. 243), in bright lights it contracts (fig. 244).

The Retina.—This, which is the most internal of the tunics of the eye, is a sheet of nerve tissues situated between the choroid coat and the vitreous humour, specially organized to receive and transmit impressions of light. Its structure (fig. 245) is very complex, but it consists essentially of an outer layer of rods and cones, followed by several layers of cells and nuclei, with interwoven fibres, which give cohesion and strength to the different layers. The fibres of the optic nerve terminate in the retina, and conduct the impressions made upon the retina through the optic nerve to the brain. The accompanying woodcut will sufficiently demonstrate the structure of the retina as now received by the best observers.

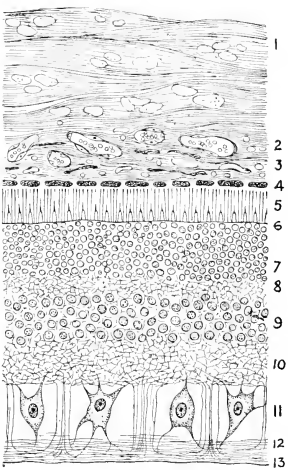


Fig. 245.—Microscopic Section of the Retina, Choroid, and Part of the Sclerotic

1, Sclerotic. 2, External Vascular Portion of the Choroid. 3, Internal Vascular Portion of the Choroid. 4, Pigment Cell Layer. 5, Layer of Rods and Cones. 6, Membrana Limitans Externa. 7, External Nuclear Layer. 8, External Molecular Layer. 9, Internal Nuclear Layer. 10, Internal Molecular Layer. 11, Ganglion Layer. 12, Nerve-fibre Layer traversed by Müller's Sustentacular Fibres. 13, Membrana Limitans Interna.

The Humours of the Eye.—The aqueous humour (fig. 240, K) is a limpid fluid which occupies the space between the cornea and the lens. The quantity is estimated at about 1 fluid drachm. It appears to be secreted by the ciliary processes, and undergoes constant renewal. That which is freshly secreted is poured forth into the *posterior chamber* of the eye, and therefore occupies the space between the back of the iris, in front, and the tips of the ciliary processes, the suspensory ligament of the lens, and the lens itself, behind. The fluid passes through the aperture of the pupil into the anterior chamber of the eye, and escapes by a natural channel situated

in the angle of this chamber at the line where the iris and cornea are in contact. The channel is named the canal of Fontana, and communicates with another canal named the canal of Schlemm.

The Lens (fig. 240, J) is a perfectly transparent biconvex solid body, about half an inch in diameter. The front surface is less convex than the posterior. It lies behind the iris, and is lodged in a depression of the vitreous humour. It is kept in position by a circular ligament which is formed out of a continuation of the modified outer layer of the retina and extends from the ciliary processes to the margin of the lens.

The lens is enclosed in a capsule, which is thick in front and thin behind. It is composed of long fibres with sawlike edges, which mutually interlock with those of the adjoining fibres; and these are arranged in many layers, the outermost being soft, becoming denser as the central part of the lens is reached. By the lens, parallel or nearly parallel rays of light are brought to a focus on the retina, and a precise image is there formed. Opacity of the lens constitutes cataract.

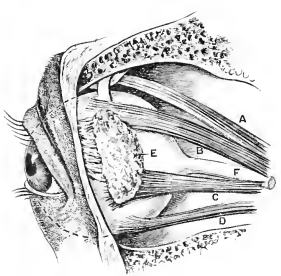


Fig. 240.—The Eye, showing the Lachrymal Gland

A, Superior Oblique Muscle. B, Levator Oculi or Superior Rectus. C, Abductor Oculi or External Rectus. D, Depressor Oculi or Inferior Rectus. E, Lachrymal Gland. F, Optic Nerve.

The Vitreous Humour (fig. 240, H) is a semi-fluid, uniform substance, like white-of-egg in consistence, traversed by numerous delicate fibres which appear to be the remains of cells with greatly attenuated and elongated processes. It is enclosed in a transparent and very thin membrane termed the *hyaloid membrane*. The vitreous humour presents a canal running through its centre from behind, which originally contained blood-vessels on their way to the posterior surface of the lens, but both the canal and the blood-vessels disappear in infancy. In front the vitreous humour is hollowed out, so as to give lodgment to the convex surface of the lens in front of it. Near the margin of the lens is a structure named the *Zonule of Tinn*, composed of fibres which are superimposed upon the hyaloid membrane and forming the suspensory ligament of the lens, whilst they are so arranged as to present alternate elevations and depressions which correspond to the ciliary processes and the intervening spaces.

DISEASES OF THE EYE AND ITS APPENDAGES

It is perhaps impossible to overestimate the importance of perfect soundness of the eyes of a horse. The extreme inconvenience of a slight defect is very apparent to a rider or driver of an animal which is in the habit of shying when, so far as can be seen, there is nothing to attract particular attention.

Unfortunately, even important defects of vision may be attended with such obscure signs as to be absolutely undiscoverable by the ordinary methods of examination which are at the command of an amateur. The use of the ophthalmoscope by an experienced and highly accomplished observer is often necessary for their detection. In the horse, slight errors in refraction cannot be found out even by an expert, and if they could, there is no remedy, because the optical appliances, which are so valuable in compensating even the least departure from perfectly normal vision in man, are inapplicable to any of the lower animals.

Obviously the examiner of a horse's eyes will be quite unable to distinguish some of the marked departures from the healthy state unless he has some acquaintance with the eye in its natural condition. With this view the reader is referred to the section on the anatomy and physiology of the eye. Meanwhile he is cautioned that the most ludicrous mistakes are made by persons who, in looking for diseased conditions of the eye of the horse, have not taken the trouble in the first instance to master the normal appearances which can be readily seen without the use of any optical apparatus.

EXAMINATION OF THE EYES

For the purpose of making an examination of the eye, the horse should be so placed by the observer that the light may fall on the organ either from a window or from the stable entrance, while the animal's head is either within the stable or only partly out of it. In this position the examiner will naturally first note the condition of the eyelids and the movements of the eye. If, during this time, the animal happens to be suddenly alarmed, even by the movement of a hand towards the eye, he will also witness the rapid protrusion of the haw (fig. 247) (*cartilago nictitans*) over the front of the organ, as if to protect it from injury. In the section on anatomy and physiology the structure and uses of this organ are described.

Having the eye in a good light, the examiner will note the white portion of the globe, with its numerous vessels ramifying in all directions, and the

transparent cornea forming the front of the eye. Looking through the cornea he will observe the curtain behind it which gives the colour to the eye, and is therefore termed the iris, with the opening in the centre of it, the pupil, through which the light passes, carrying with it the image which is to be depicted on the retina. At the edge of the pupilary opening the small black, pea-like bodies, which have been described as the corpora nigra, will be seen; small, or even extremely minute, at the lower edge of the pupil, considerably larger at the upper edge, these little bodies are worth particular attention, because they are constantly taken by the inexperienced for a diseased condition of the eye. Looking through

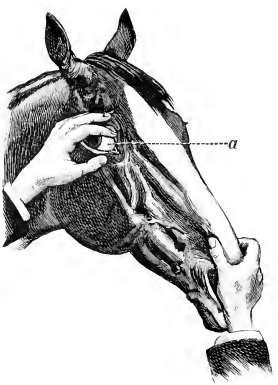


Fig. 247.—Examination of the Eye (*a*, the Haw)

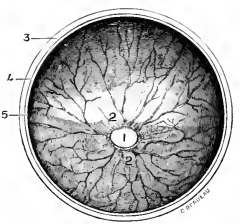


Fig. 248.—Fundus of the Eye

1, Entrance of the Optic Nerve to form the Retina. 2, 2, Blood-vessels entering around it (there is no arteria centralis retinæ in the horse as in man). 3, Divided Sclerotic. 4, Divided Choroid. 5, Divided Retina.

the pupilary opening, if the eye is in the proper position, the examiner will see a small pearl-like body at the bottom of the posterior chamber which marks the entrance of the optic nerve (fig. 248, 1); this body is worthy of particular notice as it is frequently mistaken for a cataract.

A quarter of an hour occupied in this examination every day for a week should make the tyro familiar with some of the more important parts of the anatomy of the visual organ and its appendages, so that he will be able to recognize any decided changes resulting from disease without running the risk of making the curious mistakes which are so extremely common.

During the examination the observer will note that the eye of the horse is never for more than a second in one position. In examining the eye of a friend this difficulty entirely vanishes, as the organ can be kept perfectly still while the inspection is being made, but there are positively no means

of securing this fixity in the eye of the lower animals except by putting them under the influence of an anæsthetic, and anyone desiring to examine the eye is required to train his own eyes to follow the movements of the organ, so that he may keep the part which he wishes to see in view during the time that it is in constant motion.

DISEASES OF THE EYELIDS

An account of the different diseases to which the organ of vision is liable may conveniently deal, in the first instance, with the eyelids, which are frequently implicated in one way or another in disease or injury affecting the globe.

Blows inflicted intentionally or by accident are the most common form of injury to the eyelids, and it is often the case that the inflammation, with swelling and redness of the lining membrane extending over the front of the eye and reflected on the insides of the lids, are the only symptoms which result from the blow, unless it has been sufficiently severe to cause a contused wound. Exactly the same kind of symptoms will be present when the inflammation is the result of a cold, or febrile condition of the system, or of the introduction of an irritating substance under the lids, and it is therefore impossible to be quite certain whether the inflammation, swelling, and discharge of tears observed are due to one or other of the causes named unless there is some history to assist the diagnosis.

Any manual examination of the diseased eye naturally excites the animal's fears, particularly should he be unable to see the operator who is engaged in manipulating the part, and unless there is some reason to suspect that the irritation is caused by a foreign body which has entered the eye, it is better to leave the diseased parts alone until the inflammation is diminished.

The first step in the treatment should be to place the animal in a position where there is only a subdued light—entire exclusion of light is not necessary. Fomentations of warm water should then be applied, by squeezing the water from a sponge laid on to the skin above the injured organ, or by fixing a piece of soft rag in such a position that the water may run from it over the swollen eye, the least pressure to the diseased parts being avoided. As the inflammation subsides, the lids will gradually open and assume their normal character, and it will now be easy to see if the injury has affected the transparent cornea. Sometimes a white line running obliquely across the front of the eye will suggest a cut from the lash of a whip; in other cases there may be a general opacity over the whole of the transparent structure, and in other instances the symptoms

which are apparent will satisfy the examiner that the disease in the lids which was taken to be the result of injury was merely the indication of a much more serious malady—periodic ophthalmia,—which has yet to be considered.

LACERATION OF THE EYELIDS

Laceration of the eyelids, upper or lower, generally occurs in consequence of the presence of a nail or a splinter of wood, &c., projecting out from some part of the stall or box, against which the animal may accidentally strike its head during a sudden movement. Occasionally it happens that one of the lids is nearly torn off and left hanging by a small portion which still remains intact. Even this severe form of injury, however, need not discourage the operator, whose first duty is to cleanse the part with a little weak solution of carbolic acid, and then to adjust the edges of the wound with the greatest care, and apply a sufficient number of stitches with a very fine needle, so as to keep them in perfect apposition. No subsequent treatment will, as a rule, be necessary; the thin layer of lymph which exudes from the divided surfaces will act as a most perfect cement, and must on no account be disturbed. Generally, healing takes place by what is called first intention. Now and then, however, a small portion of the damaged structure may fail to unite. In such cases slight stimulation is desirable, when pencilling the edges of the wound very slightly with nitrate of silver will have a good effect. In most cases of injury of the kind described the cure is quite perfect, and when the healing process is concluded, the blemish which is left is exceedingly slight.

Some writers on diseases of the eyes of the horse refer to abscesses in the eyelids associated with catarrhal diseases of an acute type. This affection, which is very well known in human beings, *i.e.* stye (*hordeum*), is really a small abscess affecting some of the sebaceous or grease follicles on the edges of the lids. In the lower animals, however, this form of disease is very rare.

ENTROPIUM AND ECTROPIUM

In consequence of muscular spasm, or from loss of structure due to disease or injury, burns especially, the eyelids are liable to become more or less distorted. Two forms of distortion are recognized, and distinguished as entropium and ectropium.

Entropium.—In this deformity the diseased lid is inverted or turned inwards, so that the eyelashes are brought in contact with the sensitive conjunctiva, causing considerable pain and inflammation, with an excessive

secretion of tears. The only effective remedy is the performance of an operation, which consists in taking away a portion of skin a little distance from the edge of the diseased lid, and running parallel to it, for the

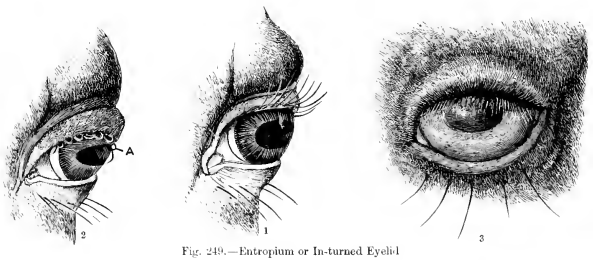


Fig. 249.—Entropium or In-turned Eyelid

1, Normal Eye. 2, Eye affected with Entropium (the in-turned lashes shown at A). 3, Eye affected with Entropium (front view).

whole distance of the inverted part. The lips of the wound are then brought together by sutures in such a way as to pull the inverted lid outwards, and keep it in that position until the wound artificially made

Fig. 250.—Ectropium or Everted Eyelid

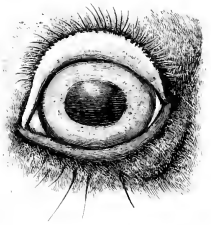


Fig. 251.—Ectropium or Everted Eyelid (Front View)

heals. On this being completed, the eyelid is found to occupy its natural position, and the trouble ceases.

Ectropium.—This condition is exactly the opposite of the one previously described; the affected lid is turned outwards instead of inwards, exposing the conjunctival membrane with which it is lined. Like the other deformity, this usually results from burns or from inflammation of the conjunctiva, and almost invariably affects the lower lid. To correct this,

a caustic pencil should be drawn across the mucous membrane so as to occasion a slough, when the lid will be drawn up or down in the process of cicatrization.

DISEASES OF THE LACHRYMAL APPARATUS

Disease of the lachrymal gland, which secretes the tears, and obstruction of the lachrymal duct, which carries any excess of their secretion into the nasal cavity, are morbid conditions only occasionally met with in veterinary practice in this country. The same remark may be made of redness and ulceration of the edges of the lids with the loss of eyelashes, "Blepharitis ciliaris"; constriction of the opening of the eyelids, "Blepharophimosis"; irregular arrangement of the eyelashes, "Triachiasis"; adhesion of the eyelid to the globe of the eye, "Symplepharon"; and other affections which are met with in the human subject but are seldom seen in the eye of the horse.

DISEASES OF THE CONJUNCTIVA AND CORNEA

Simple Ophthalmia.—Inflammation of the membrane which lines the eyelid (conjunctiva) is known as simple ophthalmia or conjunctivitis. The disease may present itself in various forms, from the acute to the chronic. In all stages of the disease the normal secretion from the membrane undergoes certain changes, and in the human subject the terms catarrhal, purulent, and diphtheritic ophthalmia are employed to indicate the nature of the discharge.

Causes of simple ophthalmia are—exposure to cold, the action of irritating gases, dust, bits of chaff, and other foreign particles, injuries, and it is very often associated with febrile diseases.

A distinction may at once be drawn between inflammation of the conjunctiva resulting from the causes referred to and swelling of the lids arising out of injury. The symptoms in the former case are less sudden in their appearance, generally beginning with slight redness of the membrane and an increased secretion of tears. As the disease advances the discharge becomes thicker, and more or less opacity of the cornea may follow; the animal instinctively avoids exposure to a strong light, and the swelling of the eyelids becomes gradually more marked. The treatment of these cases will depend upon the stage which the disease has reached. If the inflammation is of the sub-acute or chronic form astringent lotions may be applied at once, and a weak solution of sulphate of zinc, two grains to the ounce of water, will be effective. It may be

applied by gently pulling down the lower lid and dropping the fluid into the eye by means of a camel's-hair pencil.

When the affection is in the acute stage, a mild dose of physic should be given at the outset, and fomentations of warm water applied to the affected eyes, to be followed by an astringent lotion when the inflammation subsides. In cases where ophthalmia is connected with febrile disease—influenza for example—an important point is to place the animal where the eyes will not be irritated by too much light. The main treatment, however, should be directed to the cure of the systemic disease, and it may be that no local remedies will be needed.

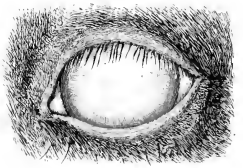


Fig. 252.—Opacity of Cornea

The practice of bleeding from the eye-vein has for a long time been discontinued.

When ophthalmia assumes the purulent form it may be necessary to apply a more powerful astringent lotion, and a solution of nitrate of silver, three grains to the ounce of distilled water, is generally very effective in altering the character of the discharge, and in removing diphtheritic or granular deposit which sometimes accumulates on the surface of the membrane.

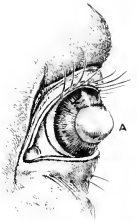


Fig. 253.—Staphyloma
A, The grape-like tumour.

Inflammation of the Cornea, "Keratitis".—Affections of the cornea include inflammation, which is sometimes followed by suppuration, or the development of "matter" between the layers of the cornea, and ulceration. In all these morbid conditions the conjunctiva necessarily participates.

Inflammation of the cornea is invariably attended with more or less opacity, and may even proceed to the formation of an abscess, as it is sometimes termed; but it is necessary to note that the deposit of pus in the structure of the membrane is only indicated by a diffused yellowness in certain parts of it, and not by the ordinary form of swelling, gradual softening, and finally bursting of the sac and discharge of its contents. It would, however, be expected that whenever pus is formed a permanent opacity of the cornea in that portion will be the consequence (fig. 252).

Ulceration of the cornea is not uncommon in the dog, in one form of distemper, but it seldom occurs in the horse.

An alteration in the form of the cornea, consisting of a protrusion of the central portion in the form of a grape-like tumour (fig. 253) (*Staphyloma*) associated with distension of the globe of the eye, has been met with occasionally as the result of inflammation. It is obvious that no treatment which can be employed would prevent the loss of sight in such a case, but when the appearance of the organ is objected to, the tumour may be dissected off with a reasonable probability of the wound closing, or the eye may be entirely extirpated by an operation which is very easily performed and is generally successful.

Periodic or Recurrent Ophthalmia.—A form of ophthalmia which is known as periodic, or sometimes as "moon-blindness", is peculiar to the horse, and in all probability is chiefly due to heredity. The cause to which it was formerly attributed, *i.e.* irritating gases and badly ventilated stables, is evidently inadequate to explain its presence. The fact that other animals are constantly exposed to the influence of the same conditions without suffering is in itself sufficient to throw considerable doubt on the once-accepted explanation.

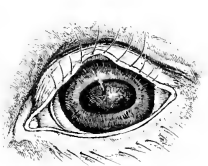


Fig. 254.—Recurrent Ophthalmia

Eye showing an angular condition of the upper lid the result of a succession of attacks of Specific Ophthalmia.

It is undoubtedly true that the disease is much less frequent than it formerly was, and it is also true that for many years past great care has been taken at horse shows to reject all animals which gave evidence of having suffered from the malady. In this way breeding animals affected with the disease have been marked out, and their use largely curtailed in consequence.

Symptoms of periodic ophthalmia are in the first instance closely allied to those of simple ophthalmia, but a great contrast is observed in the more advanced stages. Swelling of the eyelids, redness of the conjunctiva, and discharge of tears are the chief indications of the early stage of the disease. To the experienced examiner the diseased eye presents a characteristic appearance even at the outset of the malady, which becomes more and more pronounced with each succeeding attack. A slight contraction in the centre of the upper lid, the edge of which is drawn upward (fig. 254), gives a peculiar triangular appearance to the opening between the two lids. This is an appearance which is not met with in simple ophthalmia; the swelling is less marked also, and when there is a sufficient space between the partially closed lids to allow the surface of the cornea to be seen, a peculiar amber tinge of the part is observed. This is caused by a yellow

exudation into the anterior chamber, which at once distinguishes the disease from simple ophthalmia.

During the progress of periodic ophthalmia various changes take place. The swelling of the eyelids and the congestion of the conjunctiva gradually decrease. The amber tint, which at first extended over the whole of the cornea, becomes concentrated at the lower part, owing to the deposit of lymph gradually falling to the bottom of the chamber. In a week or two the whole of the eye begins to become clear, and in from three to six weeks there may be no trace of the disease left, and the organ is to all appearance sound. This condition may possibly continue for the space of a month, or sometimes much longer, but a recurrence of the attack is a matter of certainty. Generally the disease reappears in the same eye, but occasionally the eye originally attacked remains apparently healthy and the opposite eye becomes affected, the course of the disease in it being as nearly as possible identical with that which has been described.

Probably owing to peculiarities in the system of the horse, the disease at different times assumes an extremely acute, or a sub-acute, or chronic form. In some instances it appears to be concentrated in the eye first attacked, which suffers from repeated reappearances of the disease at short intervals, each attack leaving some morbid changes behind it affecting the internal structures, and ending in total blindness of the affected eye, either from the opacity of the crystalline lens or from the deposit of a large quantity of inflammatory material in the anterior chamber, and ultimately the formation of a false membrane lining the inside of the cornea causing a permanent yellow opacity. In this case it is impossible to ascertain what may be the condition of the structures behind the iris, but post-mortem examinations in a few cases have shown that the whole of the internal structures are implicated in the changes which are apparent in the front of the eyes, the vitreous body and the crystalline lens being the seat of the same kind of yellow deposit which occurred in the anterior chamber.

In some instances black pigment spots are noticed in front and towards the outer margin of the lens. These indicate that the iris has been adherent to the lens as a result of the inflammatory attack, and the pigment behind the former has been left on the latter. Sometimes the two remain permanently united.

When periodic ophthalmia was much more common than it is in the present day, it was a matter of observation that if the disease assumed the acute form, and repeated attacks occurred in one eye, ending in blindness, the other eye remained unaffected; but when the affection appeared first in one eye and then in the other, alternately, the result was the gradual impairment of the vision until the sight was entirely lost in both.

Treatment of the recurrent form of ophthalmia will be the same as that which has been recommended for the simple form of the disease, including a frequent application of warm water while the inflammation exists, and the use of a mild astringent lotion afterwards. It will, however, be understood from what has been said in reference to the course of the disease, that all treatment must be looked upon as merely palliative. There is no remedy known which has any influence in preventing the recurrence of the affection or in checking those morbid changes which sooner or later terminate in total loss of vision.

CUTANEOUS-PILIFEROUS GROWTH FROM THE CORNEA

Every now and again these hairy growths are noticed to present themselves on some portion of the eyeball of a horse.

For the most part they are congenital formations, but very rarely they do not appear until some time after birth.

In those cases which are congenital this growth presents itself as an

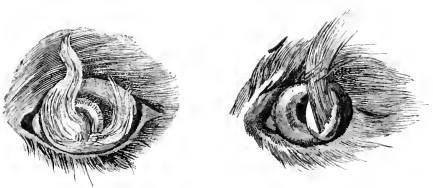


Fig. 255.—Cutaneous-Piliferous Growth from the Cornea

aberration of development. That is, a germ of skin appears in some part of the eyeball where skin does not and should not occur.

They cause the animal a good deal of annoyance and suffering as a result of their presence, and it is only by removing them with the knife that this can be remedied.

For some reason or other these cutaneous growths are most often seen in oxen and in dogs, and they are less frequently noticed in the horse, in sheep, and in the human subject.

A case is recorded as occurring in a bullock in the *Veterinary Record*, vol. xxi, p. 235, and other cases are referred to in the *Journal of Anatomy and Physiology*, vol. xiv, p. 143, and also in the *Veterinarian*, vol. xxvi, p. 777.

CATARACT

As the term cataract is usually understood, it includes changes in the crystalline lens, which convert it from a transparent body into an opaque mass (fig. 256), which may be compared to a small biconvex piece of chalk; the appearance, in fact, is the same as that which is constantly noticed in the crystalline lens of fishes when cooked, and seen in the dish as a small globular body of a dense white colour. The professional man, however, recognizes the fact that the term cataract applies to any opaque speck, or number of specks, however minute they may be, which appear in any part of the lens or its capsule; indeed, a cataract may be so extremely minute as to be absolutely invisible to the naked eye, and the use of an ophthalmoscope by an expert is indispensable for the detection of the disease in its initial stage.

One of the old veterinary writers, Dr. Bracken, in 1737, describes

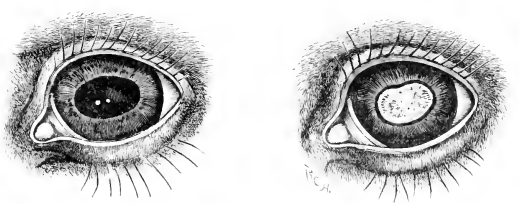


Fig. 256.—Cataract.

four varieties of cataract, *i.e.* white, pearl colour, yellow and black or green cataract. All these varieties are said to have been met with recently in different animals, but they are only to be detected on post-mortem examination, so far, at least, as the peculiarity of colour is concerned, and as a rule, post-mortem examinations are not common in connection with the existence of this disease. If the cataract is perfectly visible there is no particular object in making a special examination of the lens after the death of the animal, and if there is no evidence of its existence, it is not suspected, and therefore not sought for; but it must be clear that in all cases cataract at the commencement may be discovered by the use of optical instruments, and their use is undoubtedly called for in all cases where a horse is in the constant habit of shying, or in any way gives reason for a suspicion that the sight is defective.

Besides the division of cataracts as to colour, there is another which

affects the capsule of the lens, *capsular* cataract, and cataracts which exist in the substance of the lens, *lenticular* cataracts (fig. 257). Capsular cataracts usually appear on the front of the capsule, and in the form of small circles or extremely minute specks, the smallest of which are only rendered visible by the use of the ophthalmoscope. With this instrument the examiner has no difficulty in distinguishing capsular cataract by transmitting the rays of light obliquely into the eye so as to get a lateral view of the surface of the capsule.

From the smallest speck of opacity the disease may be said to grow, often in radiating lines, until at length the whole of the lens is implicated, and thus a number of separate spots, which are detectable in the early stages of the disease, become consolidated into one opaque mass.

A somewhat different series of changes occurs in the development of cataract by exudation, which seems to affect the whole of the lens at the same time, modifying its transparency very slightly in the first instance,

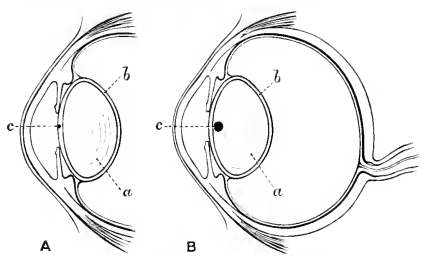


Fig. 257.—Capsular and Lenticular Cataracts

a, Crystalline Lens. *b*, Capsule of the Lens. *c*, (Diagram A), Capsular Cataract *c*, (Diagram B), Lenticular Cataract.

causing merely a slight cloudiness which gradually becomes more marked, going on to what is described as a milky condition, and ending in the chalky state which is really complete opacity. It is somewhat remarkable that, to the eye of the examiner, the lens presents a milky appearance, when on post-mortem examination it has been found to present a marked amber tint without the least trace of whiteness in any part. The deposit, however, is sufficiently dense to render the body incapable of transmitting light.

It is interesting to notice that the older writers had very much the same idea of the pathology of the disease as is entertained at present. They referred to the opacity of the crystalline humour, and mentioned the circumstance of the opaque spots affecting the capsule or some of the layers

(lamellæ) of the lens itself. They looked upon cold, injury, and, in particular, periodical attacks of inflammation of the eyes as the chief causes of cataract.

Bracken and Gibson, in 1737, and James White, in 1802, trace the disease to repeated attacks of inflammation, and by the terms of their description they leave no doubt in the mind of the reader that the disease to which they trace the origin of cataract is the periodic ophthalmia of later times. Particularly they note that when the cataract is fully formed the ophthalmic disease ceases to appear at the accustomed times.

Gibson remarks that the disease known as moon-blindness, which is one of the terms applied to periodic ophthalmia, was really nothing but the prognostic of the breeding of cataracts, and he adds that he does not remember to have met with a case, excepting in the eyes of a horse, which had been called moon-blindness. James White also speaks of heredity as a cause of moon-blindness, and that of the most intractable sort.

Notwithstanding the various causes from which cataract is said to result, there is no doubt that it sometimes appears without the animal giving any evidence of active disease. The writer has known several instances of this kind, where cataract developed without any obvious cause and without any symptoms of inflammation being presented.

The question of treatment has always given rise to a good deal of difference of opinion. In the time of Drs. Bracken and Gibson the operation of couching, as it was called, was very well known to them, and they agree that the disease cannot be cured by any outward application of remedies, but only by a surgical operation, which they admit is not applicable to the lower animals on account of the impossibility of adjusting an artificial lens to compensate for the loss of the actual one. In this respect, however, the modern oculist may claim some little advance. Dr. Randolph of the Johns Hopkins hospital published some time ago an account of the removal of two cataracts in a dog. The writer comments on the general belief that artificial lenses are absolutely necessary, and goes on to state that, according to his own experience, their use has been much overrated, and he quotes cases of his patients who obtained, after some considerable practice, a fair degree of vision without the use of spectacles. In support of his opinion he mentions cases of a reproduction of the lens in perfect form after complete removal. Dr. Randolph's own operations on dogs suggest the possibility of restoring a certain degree of visual power to animals which are perfectly blind. In the case of the dog the operation of the removal of the lens was performed under chloroform on one eye, and in three weeks the sight was so far restored that the dog was able to make his way rapidly through a passage made by placing chairs for the purpose, and

to jump over a chair which was placed in a doorway. The operation on the second eye was equally satisfactory, and after recovery the animal was used by his owner with other pointers in the field, and was reported to be quite equal to them in his work.

Dr. Randolph ascertained that several similar cases had been reported in foreign journals. In one case an ass was the subject, with what result is not known; but the fact of the restoration of the lens after removal in dogs, rabbits, and cats renders it at least probable that the same thing might happen in the case of the horse, and the experiment is worth a fair trial, especially when the disease is detected in the very early stage.

DISEASE OF THE OPTIC NERVE—AMAUROSIS

Total blindness may be the consequence of disease of the optic nerve, or its expanded filaments which form the retina within the globe, without the exhibition of any symptoms which would be apparent in the eye to the ordinary observer. In the disease which is known as amaurosis the retina or expansion of the optic nerve is insusceptible to the action of light, which therefore ceases to be a stimulant to the nerve. Consequently the circular fibres of the iris which close the pupil do not contract, and the pupil remains widely dilated even in the strongest light. The eye is perfectly transparent, and to the inexperienced observer affords no indication of unsoundness. If the disease is limited to one eye it may exist for some time without being detected, but the tendency always is for it to extend to the optic nerve of both eyes, and in that event the horse shows that the sight is defective even in the earlier stages of the malady in a manner sufficiently well defined to attract the attention of the attendant, who will probably examine the eye without finding anything wrong.

An inspection by a professional man will lead to the discovery of the inactive conditions of the muscular fibres of the iris, but until the disease has advanced so far as to cause total blindness, the iris will still to some extent contract and lessen the size of the pupil in a strong light. The expert will, however, observe that the contraction is very sluggish, but he may hesitate to diagnose the affection as amaurosis unless he is familiar with the use of the ophthalmoscope. With this instrument there will be no difficulty in getting a good view of the optic disc, as the deficient sensibility of the nerve structures will render the horse indifferent to the light which is thrown into the interior. On getting a view of the optic disc in an amaurotic eye it will at once be evident that the normal pink tint has been replaced by a white or grayish colour, and the vessels also will be indistinct in consequence of the small quantity of blood circulating in them.

When amaurosis has advanced so far that the animal is totally blind it will generally be comparatively easy to form a correct diagnosis. The dilated and immovable condition of the pupil, which is in no way affected by a strong light, is in itself almost sufficient, but it also may be ascertained in various other ways that the sight is lost.

The manner in which the animal progresses is one of the most striking indications of the existence of blindness. The fore-limbs are lifted unusually high, the head is elevated, the ears are constantly at attention, and the gait is of the careful, dwelling kind.

A common but not infallible test is that of riding the horse, quietly of course, on to a wall, which he will touch with his nose before becoming aware of its existence. This is a better method than that of making a feint to strike the animal with a stick, because the motion which is given to the air by the movement of the stick and the hand which holds it is often sufficient to induce the horse to jerk the head away under the impression that some foreign body is approaching him, thus leading the lookers-on to suspect that a certain amount of visual power still exists.

The great importance of the use of the ophthalmoscope for the examination of eyes which present any abnormal character, however slight, will be understood when it is remembered that an animal with partial or even complete amaurosis may be passed sound by a careless examiner. No treatment is ever attempted for the cure of amaurosis in the lower animals. Small doses of strychnia have been employed in the treatment of the disease in the human subject with slight benefit, which has, however, generally proved to be temporary. Galvanism has also been used, with result of improving the sight for a short time, but neither of these remedies has produced sufficiently good results to justify any recommendation of them in the treatment of amaurosis in the horse.

GLAUCOMA

This disease is of very rare occurrence in the horse. It consists of an increased tension within the eyeball in consequence of an excessive secretion of the aqueous and vitreous humours. As a result of this the eyeball is rendered full and unyielding to the touch, and somewhat elongated from before to behind. By this change of form the animal becomes myopic or short-sighted. One or both eyes may be affected, but it is usually the case that the disease attacks each in succession, and unless combated by treatment results in serious derangement of the internal structures, of which cataract is not an uncommon consequence. The symptoms of glaucoma are variable, but it will be generally found that

the pupils are dilated and sluggish in their contraction. The anterior choroidal veins are large and visible, and the globe is hard and resisting to pressure. The media are quite transparent, but the movements of the animal indicate defective vision. When examined by the ophthalmoscope the surface of the optic disc is found to be more or less concave and pallid, and the veins are remarkably increased in size, while the arteries are diminished. The remedy in these cases consists in the operation of iridectomy, or removal of a portion of the iris.

12. THE SKIN (INTEGUMENT) AND ITS APPENDAGES

The external covering of the body, whether of the vegetable or of the animal organism, is familiarly known as the skin, a word of somewhat obscure derivation, most probably going back to the Anglo-Saxon. Integument, however, derived from *tego*, to cover, at once conveys the proper meaning. No one word, however, can express the character of the structures of which the integument is composed, nor the important functions which it is designed to perform.

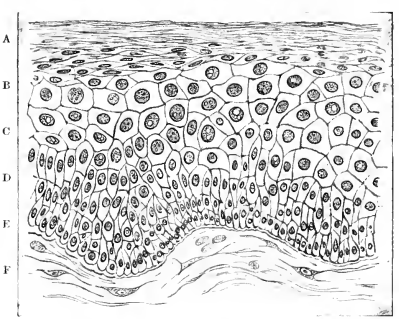


Fig. 258.—Microscopic Section of the Cuticle or Epidermis

A, Horny layer. B, C, D, E, Intermediate young round cells, becoming flattened as they approach the surface. F, Derma or Cutis Vera.

In its physiological signification the skin takes its place among the organs of special sense, being largely supplied with nerves which are capable of appreciating the impressions resulting from contact with other bodies, and also impressions of weight and alterations of temperature. In describing its structure it is usual to refer to two principal layers, the outer, composed of cells, and called the cuticle or epidermis, and the lower, entitled the derma or chorium or cutis.

Cuticle.—The cells comprising the cuticle are arranged layer upon layer, and derive their nourishment entirely from the secretory vessels of

the underlying derma. The cells which are immediately in contact with the true skin are more or less rounded, but become gradually altered in figure as they approach the surface, passing through the oval, the elongated oval, the elliptical, and finally being resolved into flattened scales which overlap each other much in the same way as do the tiles of a house (fig. 258). These changes in form and substance are occasioned under the combined influence of the upward pressure from below of the new crops of cells, which are constantly being developed, and of the downward pressure of the atmosphere on the surface, aided by the gradual evaporation of the fluid contents of the cells. The outermost layer of the cuticle is commonly

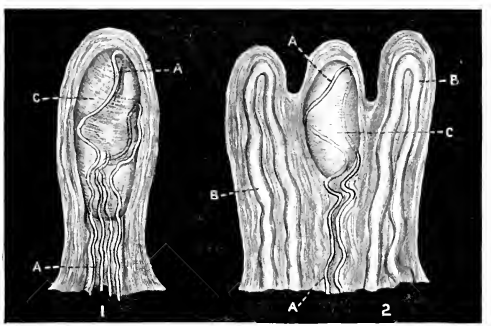


Fig. 259.—1, Simple, and 2, Compound Papillæ of the Skin. A, Nerves. B, Capillary Loops. C, Tactile Corpuscles.

called the horny layer, while the deeper portion, which consists of the younger and more recently-developed nucleated cells, some of them containing coloured matter (pigment cells), forms what is termed the *rete mucosum*. These two layers pass gradually one into the other, so that it would be difficult to say at what precise point the separation can be made.

The cuticle forms a sufficiently dense covering to protect the sensitive and vascular parts beneath, and as it is constantly being thrown off from the surface in the form of scales, which are familiarly known as scurf, it follows that it must be as constantly renewed from below. It is not, however, to be supposed that the cuticle forms a perfectly continuous coat spread over the structure of the true skin. On the contrary, it is pierced by innumerable openings to afford an exit to the watery excretion of the sweat glands, the fat-like material of the sebaceous follicles, and the hairs which emerge from the openings of the hair follicles.

Although the cuticle, as has been shown, consists of different layers of cells from the deeper, recently-formed globules, through the oval, and elliptical, to the flattened scales, it constitutes a very small portion of the total thickness of the skin.

Cutis or Derma.—The cutis, derma, or true skin, is composed of a basis of dense fibrous structure, the fibres of which are closely interwoven one with another. Distributed through the meshes of the fibrous base of the skin are various glands and follicles. In the deeper-seated portions there are small masses of fatty tissue embedded in the fibrous net-work. At the superior part of the true skin exists what is called the papillated layer of the derma, so termed from the small papillæ which everywhere stud its surface. It consists of vascular and nervous elements. The blood-vessels here are arranged in the form of capillary loops; the terminal branches of nerves wind round minute prolongations of tissue in which the sense of touch exists, and which are consequently termed tactile papillæ, or tactile corpuscles (fig. 259).

Glands of the Skin.—The glands of the skin are of two kinds: 1, sebaceous or fat-forming; 2, sudoriparous or sweat glands.

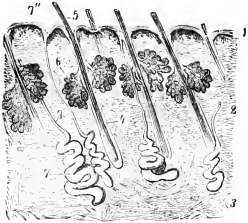


Fig. 260. Section of Skin, showing Glands and Hair Follicles.

1, Epidermis. 2, Derma. 3, Areolar Tissue. 4, Hair Follicle. 5, Hair. 6, Sebaceous Gland. 7, Sudoriparous or Sweat Gland. 7′, Duct of Sweat Gland. 7″, Opening of Sweat Gland.

Those from which the sebaceous secretion is produced are minute lobulated structures situated in the fibrous tissue of the derma (6, fig. 260). The sebaceous glands are provided with ducts, some of which open on the surface of the cuticle, but by far the greater number pour their secretion into the hair follicles. They are necessarily very numerous in animals which have a hair covering. These glands are always most abundant and of larger size and greater activity in those parts of the skin which are constantly subject to movement, as in the bends of joints, and it is extremely probable that at each flexion and extension of a joint a certain amount of sebaceous matter is squeezed out of the ducts, thus keeping the skin in a soft and supple condition.

The sudoriparous or sweat glands are situated deeper in the substance of the true skin than those above described. Some of them even pass beyond it into the subcutaneous areolar tissue. These sweat glands are not lobulated as the sebiparous or sebaceous glands are, but consist of one or more long tubes twisted upon themselves so as to form a more

or less rounded or ovoid gland, terminating in a single excretory duct (7″, fig. 260). The canal by which the watery secretion is discharged on to the skin as "sweat" takes a somewhat spiral course, which becomes most evident as the tube passes through the epidermis to terminate in a minute opening on the surface.

USES OF THE SKIN

Skin as a Protective Covering.—One most obvious function of the integument is that of binding the structures beneath it in such a way as to allow freedom of movement, while it keeps them in their relative positions. It varies considerably in its thickness, density, and degree of elasticity in different parts of the body. In the most exposed situations, as the back, it is much thicker and denser than in other parts of the body less exposed to pressure and friction. On the inner surface of the arms and thighs, where it is protected against the forces referred to, its texture is extremely fine, and the hairy covering is either altogether absent, or the hairs are very sparsely distributed over it. At the bends of joints the presence of a larger number than usual of sebiparous glands renders the skin particularly flexible by virtue of the lubricating action of the secretion which is constantly being poured out by them. The great advantage of this arrangement is rendered all the more evident when anything occurs to disturb it. Any interference with the secretion, or obstruction to the outpouring of the matter secreted, results in the skin in that part becoming dry, scurfy, and inflamed, developing conditions commonly known as chaps and cracks. On the other hand, in certain disordered states the secretion may be formed in excess of that which is required, when it constitutes the disease termed "grease".

Skin as an Organ of Touch.—The skin is described commonly as an apparatus of touch, a sense which resides in a special manner in the terminal parts of the extremities and the lips. It is, however, distributed more or less over the whole surface, varying in acuteness in different parts of the body. Dr. Carpenter refers, in his *Principles of Physiology*, to the researches of Prof. E. H. Webber and Dr. Ballard in reference to the relative sensitiveness in different parts of the skin. One test was that of employing the legs of a pair of compasses, the points of which, guarded with pieces of cork, were brought together as close as possible, until the smallest distance at which they could be felt to be apart from one another was reached. This was termed by Dr. Graves as the limit of confusion. A table is given, showing the limit of confusion, from which the following instances are taken. In the first place, the point of

the tongue proved to be most sensitive, as it was capable of appreciating the two points of the compass when the distance between them was only half a line. On the palmar surface of the third finger it was one line; on the red surface of the lips, two lines; on the tip of the nose, three lines; on the skin of the cheek, five lines; on the mucous membrane of the gums, nine lines; on the skin over the sternum or breast, twenty lines; on the skin over the spine of the back, thirty lines. Investigators who followed up Prof. Webber's experiments found, as might have been expected, a considerable amount of individual variation, some persons being able to appreciate the points at a half, even at a third, of the distance required by others.

The sensibility in the skin to impressions of weight has also been tested by different investigators, and it was found that, on the face, the pressure of a portion of elder pith presenting a surface of nearly $\frac{1}{3}$ inch square, and weighing only $\frac{1}{3\frac{1}{3}}$ grain, could be distinguished, whilst the tips of the fingers required a weight of $\frac{1}{3}$ grain and more, the toes as much as 8 grains, before any sensation of pressure was felt. In regard to temperature, it was found that the left hand was more sensitive than the right, although the right has the sense of touch most acutely developed. The curious fact was also noticed, that a weaker impression made on a large surface conveys the idea that it is more powerful than a stronger impression on a small surface; thus, if the forefinger of one hand be immersed in water at a temperature of 104°, and the whole of the other at 102°, the cooler water will be felt to be the warmer; further, it is a known fact that water in which a finger can be held will scald the whole hand that is plunged into it. From these experiments it may be gathered that the sense of touch does not afford much assistance in obtaining accurate information as to the temperature of bodies. Indeed, it is well known that the temperature of the surface of the person who makes the experiment has its effect. For instance, a cold hand will appreciate a very slight rise of temperature in anything it touches, whereas it would distinguish little or no change in touching a body which was nearly the same temperature as itself.

Skin as an Organ of Absorption.—Absorption through the surface of the integument has always been a matter of dispute. At one time a system of administration of medicine was in fashion, under the name of the endermic system, and was certainly based on a decided belief in the absorbing powers of the skin, but the system itself implied the use of considerable friction with mercurial preparations mixed with fatty materials in the form of ointment, the fatty matter being the more readily absorbed if it were rancid. It is stated that De Collin produced absorption in an experiment to which he had recourse, which consisted in causing water impregnated with cyanide of potassium to fall in drops on a horse's back

for several hours; the horse died from poisoning resulting from the passage of the salt, through the skin, into the system.

The power to absorb water through the skin was maintained in former times, but modern physiology rejects this idea entirely; in fact, the circumstance of patients affected with skin diseases remaining immersed in water for long periods, and still being subject to thirst, and requiring to drink as much liquid as if they were not in the water at all, proves that no appreciable quantity of that fluid is taken in through the skin. On the whole, the power of the skin to absorb fluid is generally accepted as an extremely limited one. It appears, however, that the skin can be permeated by gas. Bichat's experiment proves that the skin of a limb, if immersed in putrid gases, absorbs them, and it is alleged that all kinds of miasma may penetrate into the organism in this way with ease. Common observation suggests that the absorbing powers of the skin may have been underrated; it is admitted that it acts to a certain extent as an organ of respiration, absorbing oxygen and exhaling carbonic acid. It is recorded that Gairlach collected $\frac{1}{2}$ oz. carbonic acid in half an hour from the skin of horses at rest, and 3 ozs. at work. The poisonous action of certain fluids when applied to the skin in the ordinary processes of sheep-dipping, and dressing the skin for mange and other diseases, has come under the writer's own notice repeatedly On one occasion liquid carbolic acid was painted over the skin of two dogs suffering from mange, under a mistaken impression as to the proper mode of using the agent, which should have been mixed with fifty parts of water. The immediate effect was the occurrence of a species of epileptic fit; the animals fell over on to the ground, frothing at the mouth and showing a spasmodic twitching of the muscles. The prompt application of warm water with plenty of soap, by the aid of which the greater part of the lotion was removed, relieved the urgent symptoms, and the dogs ultimately recovered, but they continued to suffer from depression, loss of appetite, and difficulty of movement for several days.

On another occasion the dipping of sheep in a mixture of carbolic acid soap and a small quantity of turpentine, with the addition of 40 parts of water to 1 part of the mixture, was followed by the sudden death of five sheep in succession, after they had been kept in the dipping-tub for the usual two minutes. Directly the fleece had been wrung by the attendant for the purpose of removing excess of fluid, the animals rolled over on to the ground in violent convulsions, and were dead in the course of a few seconds. On looking at the mixture, which was the same that had been used repeatedly with perfect success, a quantity of brown scum was discovered on the surface, proving that the carbolic acid had not become

emulsified as it should have been, for the reason, as it was afterwards ascertained, that the water was extremely hard. The addition of some washing-soda to the water had the effect of producing a perfect emulsion, and the process of dipping the flock was continued without any further disaster.

It had previously been known that the poisonous action of carbolic acid was especially marked when the agent was applied to the skin, and the explanation ordinarily given was, that it acted as a powerful depressor of nerve function. It must, however, be allowed that it could not possibly act upon the nerves without being absorbed in the first place through the cuticle, beneath which the nerves terminate on the surface of the true skin.

The absorption of fatty material by the skin probably largely depends on the affinity which it has with the sebaceous secretion, enabling it to pass into the follicles, and there certainly appears to be good reason to suppose that some of the nutritive constituents of milk are thus taken into the system, especially the fatty matters, as young children when incapable of taking nourishment by the mouth have been sustained for some time by being kept for considerable periods in baths of warm milk.

Skin as an Organ of Secretion. — Whatever importance may be attached to skin as an organ of absorption, its activity as a secreting organ is altogether beyond question. In the first place, the cuticular cells are constantly being thrown off under the influence of attrition, and the vascular surface of the true skin is actively engaged in furnishing material for the reproduction of new cells. Further, the sudoriparous and sebiparous glands discharge both fluid and solid substances, in the form of secretions, which, as will presently be seen, perform important functions. As has already been stated, the sudoriparous or sweat glands, which are extremely numerous, separate a fluid from the blood, a considerable quantity of which is constantly being given off as invisible vapour, or *insensible perspiration*; while under conditions which excite the circulation and still further increase the body temperature, a large quantity of liquid is poured out, carrying with it a considerable amount of solid material, in which is contained various salts of the blood, as well as a large number of acids, including butyric, formic, propionic, and an acid peculiar to the sweat, which is called sudoric. This fluid perspiration is distinguished as *sensible perspiration*. The reaction of the sweat is generally acid. From some parts, perspiration contains a larger proportion of fat than from others, in association with certain nitrogenous matters, urea among them. It is understood by physiologists that the nervous system has considerable influence in regulating the function of perspiration.

One very important purpose which the perspiration serves, is that of lowering the temperature of the body by evaporation, and another is the

removal of a quantity of waste material, or excreta, from the system. Suppression of the function permits an accumulation of effete products in the body, to the detriment of the general health. One of the first effects which follow is the lowering of the temperature, and certain changes in the fibrin of the blood, which is bound to be increased in quantity, and the occurrence of glandular swellings. In the case of animals which have died after being covered with a coat of varnish, it has been found that crystals of the triple phosphate of lime and magnesia are deposited in the cellular tissue and the muscles. Some of the effete products, however, which accumulate under these conditions are eliminated by the kidneys, and these organs consequently become overtaxed and congested, leading to impairment of their function and consequent retention of the urea, which it is their special province to excrete.

Sebaceous Secretion. — Glands which furnish this secretion are found distributed more or less over the entire body. As we have explained, the majority of them open into the hair follicles, where they discharge their secretion, the use of which is to lubricate the skin and preserve its elasticity and softness. The sebaceous matter consists of two-thirds water, the remainder being fats, extractive matters, a small quantity of albumenoids, and earthy salts.

Summary.—To sum up the functions of the skin: first in importance is the protection which it affords to the sensitive parts beneath; next, there is its sense of touch, variously developed in different parts of the surface of the body; then its power of perception of the weight and temperature of bodies, its use in some degree as an organ of respiration, and finally, its influence as an excretory and secretory structure.

APPENDAGES OF THE SKIN

The appendages of the skin are only two in number: *i.e.* hair, and its modifications in the form of horn, nails or claws.

Hair.—Hair arises from the bottom of small pits, or follicles, situated in the true skin, in some cases passing completely through it into the tissues beneath (4, fig. 260). Each hair is composed of a bulb, a portion of which is concealed in the follicle, and commonly described as the root, and a free portion or shaft which projects from the surface. The bulb of the hair consists of an aggregation of young epithelium. At its lower extremity it is hollowed out, and fits on to a small papilla at the bottom of the hair follicle.

Hairs possess a covering of flattened scales or cells arranged, like the outer layer of the cuticle, in the form of tiles on a roof. The outline

of each cell is perfectly well defined on the surface of the hair, as can be seen by examination under a moderate magnifying power. The epidermis extends into the follicle very near to the bulb. Within the epidermis or outer layer is the cortical substance of the hair, in which the pigment granules, to which it owes its colour, are distributed. The cortical substance forms the chief part of the bulk of the hair. It is composed of long elliptical fibres, which may be reduced to their elements, *i.e.* epithelial lamellæ with their nuclei. Under the microscope this portion of the hair exhibits the appearance of longitudinal stripes or fibres.

The third portion of the hair is the so-called medullary substance; this occupies the narrow cavity in the centre, which extends from the bulb upward towards the point. The hair follicle, in which the root is embedded, is really an involution or doubling down of the skin itself. It presents for notice, proceeding from the inside of the follicle, a membranous structure, consisting of cells similar to those forming the deep layer of the cuticle, *rete mucosum*, on which is imposed the internal sheath of the hair, in reality the involuted epidermis.

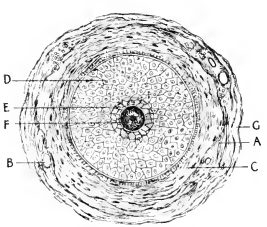


Fig. 261.—Section of Hair Follicle

A, Dermic Coat of Follicle. B, Outer Layer of Dermic Coat with Blood-vessels. C, Inner Layer of Dermic Coat. D, Epidermic Coat or Root-Sheath. E, Inner Root-Sheath. F, Hair. G, Lymph Space.

Besides hair of the ordinary kind as described, there are certain varieties which present special characters. For example, what is ordinarily described as "horse hair", and employed for the purpose of stuffing cushions and weaving into coverings, is an extremely coarse variety, occurring in the forelock between the ears, passing along to the top of the neck as far as the withers, constituting the mane, existing also upon the margin of the eyelids, eyelashes, and growing here and there on the outside of the lips and below the eyes, described as tentaculæ. These coarse hairs are developed in the most prominent form upon the tail, from which they grow to an extraordinary length, reaching almost to the ground if left uncut. Similar hairs also grow at the back of the fetlock joints, investing the horny growth which is known as the *ergot*.

The variety of hair which is described as wool, is distinguished by its fineness and softness. It does not, however, under the microscope, present any elements which differ from those already described.

Horn.—This structure may be correctly described as a form of hair cemented together into a dense mass, and employed to protect those parts

of the body—the feet, for example—which are subject to constant attrition. In the horse there are first and most important the hoofs, which protect the internal foot, the oval-shaped bodies on the inside of the fore-legs immediately above the knee-joint, and the inside of the hind-legs, just below the hock, described as *chestnuts*, and the bodies which have already been mentioned behind the fetlock-joints, the *ergots*. A careful examination of all these horny productions will prove that in their elementary structure they are composed of the same elements as the hair which covers the animal body. They rest upon, and are secreted by, a papillated membrane, and consist entirely of cells varying in form and character much the same as they do in the several parts of the hair, from the centre to the surface. The horn fibres or hairs passing from the coronet to the ground surface, forming the crust, and the horn fibres passing from the vascular membrane at the bottom of the foot to the ground, forming the sole, may all be resolved into epithelial cells, like those of the cuticle. Altogether, the structure of horn may be said to consist of bundles of hair closely applied to each other to form a compact covering to the parts

Fig. 262.—Lamellæ of Horn

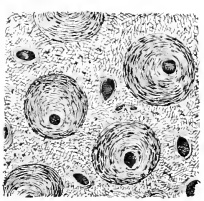


Fig. 263.—Transverse Section of Horn

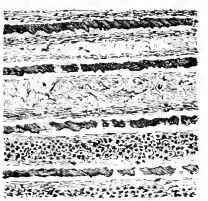


Fig. 264.—Longitudinal Section of Horn

beneath. In certain diseases, "canker" of the feet, for example, the horn on the diseased surface always appears in the form of tufts of hair, or of horn fibres, which, in consequence of the disease, have failed to adhere and form a compact structure. The study of the anatomy of the hair of different animals, as compared with the horny production, is an exceedingly interesting one, and it is perfectly easy to find the analogues in the hairs of some of the thick-skinned animals, such as the rhinoceros and the elephant, transverse sections of which, when examined by the microscope, can hardly be distinguished from transverse sections of the hoof of the horse.

DISEASES OF THE SKIN

CLASSIFICATION

A section on diseases of the skin presents to the writer certain difficulties, not on account of the want of material, but rather from its redundancy. The reader may be inclined to observe, speaking from his own experience, that a very limited literature should be sufficient to deal with the affections which attack the exterior of the animal body. The contrary is in reality the case. Dermatology is a very wide subject, and during the past century a large number of most distinguished medical authorities on the Continent, especially in Germany and France, and also in England, have devoted almost exclusive attention to disorders of the skin. Among the writers in Germany the names of Ferdinand Hebra and Virchow, and in England Willan, Bateman, Erasmus Wilson, Todd Thompson, M'Call Anderson, Tilbury Fox, Malcolm Morris, may be mentioned among a host of other distinguished men. Willan's system of classification formed the basis of the other different systems which have from time to time attracted the attention of the scientist, but even some of our modern writers still hold that the system of Willan and Bateman is for practical purposes preferable to what is called the natural and the pathological systems of classification.

The first attempt to classify diseases of the skin was made by Hieronymus Mercurialis in 1572, by whom skin affections were divided according to their locality, as those of the head and those of other parts. This simple arrangement was added to by Daniel Turner, in 1743, and by Alibert in 1806, who subdivided the diseases. Scientific classification is said to have begun with Plenck, Vienna, 1776, who took as his basis the objective features of the diseases, grouping Affections of the Skin under fourteen heads: (1) Macules, (2) Pustules, (3) Vesicles, (4) Bullæ, (5) Papules, (6) Crusts, (7) Scales, (8) Callosities, (9) Excrescences, (10) Ulcers, (11) Wounds, (12) Cutaneous insects, (13) Diseases of the nails, (14) Diseases of the hair.

This classification to some extent was modified by Willan, who used the terms (1) Papules, (2) Scales, (3) Exanthemata, (4) Bullæ, (5) Pustules, (6) Vesicles, (7) Tubercles, (8) Macules; and Willan's pupil Bateman added Dermal excrescences.

Erasmus Wilson adopted an anatomical system of classification, grouping the skin affections according to the structures in which they arose, making four divisions: (1) Diseases of the derma, (2) Diseases of the sudoriparous

glands, (3) Diseases of the sebiparous glands, (4) Diseases of the hair and hair follicles.

Hebra in 1845 adopted a pathological system, dividing skin diseases into twelve classes: (1) Hyperæmias, (2) Anæmias, (3) Anomalies of secretion of glands, (4) Exudations, (5) Hæmorrhages, (6) Hypertrophies, (7) Atrophies, (8) Neoplasms, (9) Pseudoplasms, (10) Ulcerations, (11) Neuroses, (12) Diseases caused by parasites.

Dr. Tilbury Fox, whose work on skin diseases is constantly referred to by dermatologists, proposes a system of classification which he considers will be found the best for all practical purposes, in the following ten groups:—(1) Eruptions of the acute specific diseases, such as small-pox, &c. (2) Local inflammations, including erythema, roseola, urticaria (nettle-rash) and certain medicinal rashes; catarrhal inflammations, as in eczema; papular inflammations, for example, lichen and prurigo; bullous inflammations, including herpes, &c.; suppurative inflammations, including pustular eruptions; squamous inflammations, including pityriasis, rubra, and psoriasis. (3) Diathetic disorders, including strumous and leprous diseases of the skin. (4) Hypertrophic and Atrophic diseases, as warts, corns; and ichthyosis, affecting the epithelium; also keloid, fibroma, scleroderma, affecting the connective tissue of the skin; and among atrophies, senile decay and atrophy. (5) New formations—cancer, lupus, and rodent ulcer. (6) Hæmorrhages, for example, purpura. (7) Neuroses, as hyperæsthesia, anæsthesia, and pruritis. (8) Pigmentary alterations. (9) Parasitic diseases, including animal or dermatozoic itch, and phthiriasis or lousiness, effects of fleas, bugs, gnats, &c., and vegetable or dermatophysis, as in different forms of ringworm. (10) Diseases of the glands and appendages, sweat glands and sebiparous glands, diseases of the hairs and their follicles, and diseases of nails.

This method of classification appears to be most applicable to the skin diseases of the horse.

GENERAL OBSERVATIONS ON THE SUBJECT OF DIAGNOSIS AND TREATMENT

It may be stated at the outset that the horse is comparatively exempt from many of the diseases referred to in the systems of classification which have been quoted; but in making this admission it is important to note that the skin diseases of the horse did not attract any particular attention from the older veterinary writers, and even in regard to the authorities of the present time, although they have adopted a system of classification taken with certain modifications from the system accepted by the most distinguished dermatologists, nothing like a special course of study of the

skin diseases affecting the lower animals has yet been initiated in our schools. It seems to be even now taken for granted that in its veterinary aspect dermatology need not be elèvated to the prominent position which it occupies in medical science as applied to the human subject. It will not, however, be out of place to suggest that a closer study of the methods of diagnosis, prognosis, and principles of treatment, might lead to considerable changes in the above views.

DIAGNOSIS

To arrive at a correct conclusion as to the nature of any form of skin disease, the examiner must be armed with practical knowledge of the various types in which eruptive affections are exhibited, the course which the particular eruption follows, and its probable termination; and particularly is it essential that he should know whether the affection is acute or chronic, and whether it is of a kind which comes under the heading of periodicity, and whether it is associated with any form of specific fever.

In cases of diseases of the skin which are not attended at the time of the examination with any kind of eruption, the general condition of the animal and any change in the colour of the skin have to be noted, in order that an opinion may be formed as to the probability of an eruption appearing as the disease advances. In short, it is most important to determine by critical examination the exact nature of what are called by pathologists elementary lesions, all of which are distinguished by certain terms. For example, when the skin is discoloured by some alteration in the quantity or arrangement in the colouring material as the result of the irritating action of parasites, or by chemical agents, the term *macula* is applied to the discoloured patches. Stains which are due to the escape of blood from the vessels of the skin are designated *purpura*, and are therefore excluded from the designation maculæ.

Erythema means a redness of the skin arising from a determination of blood to a part. The appearance itself is easily recognized, but taken alone it does not indicate the particular disease out of which it arises, as it may depend upon a variety of causes.

Wheals. — This term is used to indicate certain elevations of the surface of the skin, the centre of which presents a pale colour, having the appearance produced by the sting of the nettle. Wheals are caused by sudden dilatation of the blood-vessels, followed by the escape of fluid from them into the centre of the swelling. These appearances, however, are not generally recognizable in the horse, owing to the colour of the skin and the covering of hair.

Papules, meaning pimples, are of various kinds, ranging from minute specks due to excess of blood in the papillæ of the skin, to the larger elevations caused by distension of the follicles, or by the deposition of lymph around them, or by solid deposits in the true skin. There are also papules or pimples formed by the collection of sebaceous secretion within the follicles, and others resulting from hypertrophy or overgrowth of normal structures, forming minute fibrous excrescences or small warts.

Vesicles are really small bladders or blisters containing a watery fluid; they naturally vary in size according to the amount of fluid which they contain. When the bladders are sufficiently extensive to be described as large bladders they are termed *bullæ*; thus, as the result of an ordinary blister, large and small water bladders, otherwise vesicles and bullæ, will easily be distinguished.

Pustules.—These elevations are distinguished from vesicles by their contents. While the vesicle contains clear watery fluid, the pustules always contain pus, and are the result of more active inflammation than occurs in simple vesicular eruption. Vesicles in some diseases become converted into pustules as a consequence of a more intense inflammation arising in the course of the ailment.

Squamæ.—The word is used to indicate scales, which are obvious enough on a mere cursory examination. A scaly condition of the skin may be an accidental condition, and simply denote want of cleanliness, or it may be an indication of irritation of the surface, or the outcome of some specific disorder.

Pityriasis, or bran disease, is not uncommon in the horse, and is a good illustration of the condition of skin which is described as squamous.

Tubercula are small lumps or large pimples, which are hard and circumscribed, and are commonly permanent. Occasionally they undergo slow suppuration, but ordinarily remain as small fibrous tumours, which are of no special significance unless they occur on parts of the body with which the harness is brought into contact, as on the shoulders and back.

Besides these changes in the skin which have been described, there are to be found crusts or scabs which consist of the dried exudation matter discharged from a broken surface. They vary in their appearance according to the character of the discharge, to the drying of which they owe their origin.

Ulcers are well known as complications in certain forms of skin disease. They consist really in destruction of the tissues of the true skin arising either from simple inflammation, or from a specific disease, as in glanders.

Excoriations are those superficial injuries due to the removal of the cuticle by friction between two surfaces of the skin, or by the act of

rubbing, scratching, or biting to relieve itching, or from the pressure of harness.

Having satisfied himself as to the existence of one or more of these morbid conditions, the examiner is in a position to make a preliminary diagnosis, possibly to form also a prognosis, and also to arrive at some conclusion as to the cause of the disease and the principles of treatment.

ETIOLOGY

The causes of skin disease are numerous, and will naturally be a subject of enquiry as soon as a diagnosis is arrived at. First, it will be evident that the causes must be either general or local, but it would appear that the two greatest dermatologists differed widely as to which of these two was in operation.

Hebra contends for the local origin of skin diseases, while Erasmus Wilson adopts the reverse of that doctrine, and advocates the view that skin diseases are, more commonly than not, the expression of some internal derangement. The question is, however, only one of degree, as it is universally admitted that there are skin diseases both of local and constitutional origin.

A good idea of the causes which are generally in operation, as well as example of the diseases they respectively induce, may be gained by reference to the following succinct, and at the same time comprehensive statement, made by Dr. Tilbury Fox in his work on skin diseases:—

1. Poisons of acute specific diseases. Examples, those of small-pox, scarlatina, rubeola, &c.

2. The circulation of special poisons: (*a*) of animal origin—as syphilitic; (*b*) medicinal substances, *e.g.* arsenic, belladonna, copaiba, nitrate of silver, iodides, bromides; (*c*) dietetic, such as shell-fish, giving rise to urticaria, roseola, erythema.

3 Dietetic errors, as in wine-drinkers, high livers, non-vegetarians, &c., leading to the increase of urea and uric acid in the blood.

4. The tuberculous, scrofulous, and lymphatic dyscrasiæ, giving rise to non-specific eruption—as impetigo, acne.

5. The gouty and rheumatic diathesis, as in lichen agrius.

6. Altered and lowered nutrition, from such causes as bad living, poverty, misery.

7. The accumulation of excreta in the blood from suppression of natural discharges, kidney disease, &c.

8. Convalescence from severe and lowering affections, by which the body is rendered much less able to resist disease.

9. Climateric or endemic influences, often malarial in nature, which act by deteriorating the system generally.

10. Disorders of the liver and spleen, leading to pigmentary deposit in various parts, jaundice and pruritus, &c.

This extract has been modified by the omission of certain diseases which are not recognized in the horse. All the morbid conditions above referred to relate to changes produced in the blood generally by the introduction of poisonous substances, or by the accumulation of animal poisons, or from the failure of the excretory organs to carry them out of the system. There are, however, in addition, to be considered various forms of mal-nutrition which lead to changes in the tissues of the skin. Changes are also produced by local irritants, as chemical agents, burns, and the ravages of parasites. It must be allowed, also, that there are certain conditions of the skin, due to heredity, which dispose the surface to certain forms of disease, such as psoriasis, cancer, and ichthyosis. Further, there are causes which act specially upon the nerves, as frequent contact with local irritants, changes of temperature. The action of local irritants, it may be observed, is frequently connected with occupation, illustrated in the case of horses which are working where building is being carried on, which exposes them to frequent contact with lime, either dry or moist, or in the case of hunters which are commonly used in districts where the soil contains some gritty or irritating particles which act upon the surface, giving rise to what is known as "mud fever", a disease which is traceable also to the habit of washing the extremities and other parts of the body with warm water after work.

To sum up the causes of skin diseases:—1. *Changes in the blood* induced by poisons, dietetic errors, tuberculous disease, rheumatic tendency, general debility, effects of malaria. 2. *Changes in the tissues*, due to mal-nutrition, local irritation, whether from chemical or physical agencies, inherited peculiarities of the tissues. 3. *Influences which act specially on the nerves*, as dirt, exposure to excessive cold or heat, and sometimes organic disease of certain organs which by sympathy excite chronic congestion of different parts of the skin.

PROGNOSIS

Having considered the possible or probable causes, the next step will be to decide as to the duration of the disease, and the chances or otherwise of cure—matters in which the owner of the horse is always particularly interested. Prognosis will be materially assisted by a history of the case. In the first place, the ground may be cleared by the recognition of the

fact that skin diseases, with a few exceptions, are not fatal. Those affections which are hereditary are the most difficult to cure. Psoriasis, eczema, and urticaria, and, it may be added, those forms of itching which are not associated with any eruption, such as pruritus, are likely to recur, although they may yield to simple treatment.

In the case of parasitic disease, such as ringworm and mange, in the horse, the cure is generally tolerably easy if taken in the early stages; in cases where the animal has been long neglected, especially when the disease is due to the burrowing mite (sarcoptic mange), the cure sometimes proves to be absolutely impossible, and in many of these cases the system has become so debilitated by the ravages of the parasite and the unrest of the patient that a fatal result is by no means uncommon. More frequently still it is considered advisable to destroy the subject as incurable.

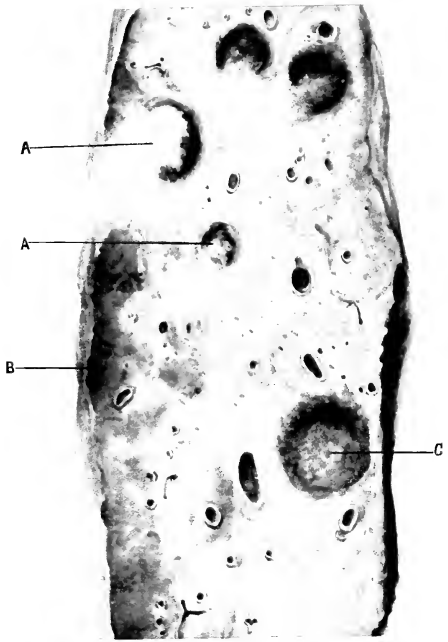
THE PRINCIPLES OF TREATMENT

Reference to the causes which have been indicated will at once suggest that the remedies required may be purely local, or constitutional, or a combination of the two. In the case of purely local affections, such as the irritation excited by irritants, erythema, simple eczema, and parasitic diseases, local applications will usually suffice, although even in such cases it will have to be borne in mind that the state of the system will materially influence the progress of the disease, and certain changes of diet, or regulations as to exercise and work, may be expedient, if not absolutely necessary. All forms of skin disease which come under the head of acute specific disorders—variola, horse-pox, urticaria from indigestion, medicinal rashes, lead poisoning, nerve diseases, and others of a like kind—will be dealt with by constitutional means; the employment of local remedies will be admissible as palliatives, as, for example, where the itching from medicinal rashes, neurotic diseases, sympathetic pruritus, or urticaria *ab ingestis* renders the animal restless and sometimes prevents it from taking its food.

ERUPTIONS OF THE ACUTE SPECIFIC DISEASES

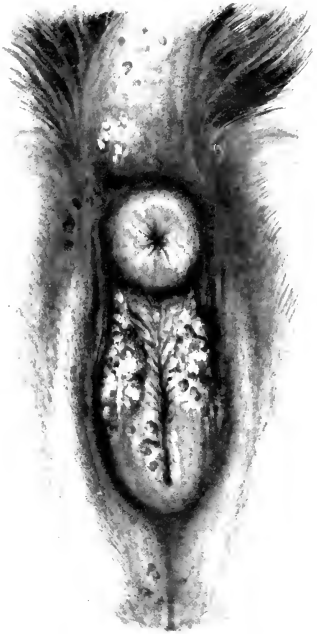
Variola Equina or Horse-Pox.— It is a matter of history that at one time it was an accepted doctrine, in regard to the origin of vaccine matter, that the disease in the cow which was described as cow-pox was the result of infection from a disease in the horse which attacks the heels of the animal and is named "grease".

According to Professor E. M. Crookshank, in his classical work on the pathology of vaccination, the disease was thus described by Jenner:



EMBOLISM OF LUNG

A, A. Embolic abscesses.
B. Pulmonary haemorrhage.
C. Empty abscess.



VARIOLOUS ERUPTION

Showing vesicles, pustules, and ulcers on labia and tail of mare.

"There is a disease to which the horse from his state of domestication is frequently subject. Farriers have named it the grease; it is an inflammation and swelling in the heel, accompanied at its commencement with small cracks and fissures, from which issues matter possessing properties of a very peculiar kind.

"If the men who dressed the horses' heels were called upon to milk cows, they communicated to them the malady known as the cow-pox."

Several cases are recorded in proof of this statement, and from one particular case Jenner was led to believe that the virus which produced cow-pox might be obtained from other parts of the body of the horse.

It is now perfectly well known that the facts as stated are correct, but that the explanation is wrong. The fact is that the horse suffers from a form of variola, and also suffers from cracked and greasy heels, and when horse-pox, equine variola, attacks a horse which happens at the time to be suffering from grease, the characteristic eruption of horse-pox is quite likely to appear in the already irritated skin of the heel, and in such case the matter of greasy heels, together with the variolous contagion, might every now and then be carried to the udder of the cow and produce cow-pox. It would, however, probably be more correct to look upon the recorded outbreaks of cow-pox which followed the act of milking by the hand of a man who had dressed the greasy heels of a horse as mere coincidences. It is quite certain that the matter of ordinary grease will not produce cow-pox; it is equally true that the horse is subject to a genuine variola, which, when transmitted to the cow, induces the other form of variola, *i.e.*, vaccine disease.

Horse-pox, or variola, although it undoubtedly occurs in this country in isolated cases, has never assumed the virulence which it exhibits on the Continent. In Professor Crookshank's work on vaccination several extensive outbreaks are described. The first one which has been recorded occurred in 1860, and it is stated that in less than three weeks there were more than a hundred cases. The horses suffered from slight fever, rapidly followed by the local symptoms, swelling of some of the joints, and an eruption of small pustules on different parts of the body, especially on the lips, nostrils, buttocks, and generative organs. In about a fortnight the pustules dried up, the crusts with patches of hair fell off, leaving marked scars.

In some instances the pustules appeared inside the nostrils, giving rise to a suspicion that the animal was affected with glanders. Cases have occurred in this country of eruption of small pustules on the legs, outside of the nostrils, and on different parts of the body, simulating the form of

glanders which affects the skin and is known as farcy. These cases, which have been described as pseudo-farcy, were in all probability horse-pox.

Treatment.—In this affection there is little requiring to be done in the shape of treatment beyond upholding the animal's general health by careful feeding and stable management. If the bowels are constipated, two or three small doses of sulphate of magnesia given in the drinking water will act as a corrective; it may be desirable to administer a little nitrate of potash in the food once daily during the existence of the disease, to prevent undue swelling of the legs. Local treatment should consist in sponging over the seat of eruption night and morning with a ten-per-cent solution of carbolic acid, and dusting a little boracic acid and flour over the pustules.

The diseased animal should be isolated and placed under the care of special attendants.

All brushes, cloths, rugs, bandages, and stable utensils used for the purpose of the sick, should not be brought into contact with the healthy. After the disease has disappeared, these, as well as the stable and its fittings, must undergo thorough disinfection and cleansing.

American Horse-Pox.—For several years past an eruptive disease of the skin of the horse, characterized by the development of small pustules, has been recognized in this country, particularly among animals sent for exhibition. For some reason which is not well defined, the disease is considered to have been imported from America; it is usually mild in character, though for the time troublesome; the pustules very soon become dry, and the crusts fall off, leaving small scars which soon disappear. It is essentially a form of ecthyma, and will be treated under that heading.

ERUPTIONS DUE TO THE CONTACT OF IRRITATING AGENTS, OR TO THE CIRCULATION OF SPECIFIC POISONS IN THE BLOOD

It is well known that various forms of skin eruptions are due to the attacks of various insects, as lice, fleas, gnats, gadflies, &c., also from the ravages of acari; and certain vegetable parasites which establish themselves in or on the integument, for example, the well-known ringworm fungus. Eruptions also occur as the consequence of the contact of such agents as mustard, paraffin, solution of carbolic acid, arsenic, and even soft soap; when this agent has been used in strong solution for the purpose of washing the skin, and a quantity of it has been carelessly left upon

the upper part of the body, extensive eruption along the centre of the back has been observed, in cattle particularly. It will be noticed that the degree of irritation produced is largely dependent upon the sensibility of the skin; when this is thin and delicate, the application of mustard or ammonia will often produce extensive erythema, followed by the formation of vesicles, and ultimately desquamation of the cuticle, and maybe a superficial ulceration, while the same agent applied to an animal with a coarse skin produces little or no effect. The use of arsenic as a caustic in the treatment of warts has sometimes caused extensive inflammation of the skin surrounding the wart, with considerable sloughing. It has already been stated that horses working where the ground is covered with lime suffer from inflammation of the skin of the legs, accompanied by cracks or fissures. Sometimes inflammation of the glandular structures of the skin arises out of the same cause, accompanied by a considerable discharge of sebaceous fluid.

Internal agents, such as articles of food and various drugs, give rise to eruptions in the skin of susceptible subjects; the eruption known as nettle-rash following the eating of mussels and other shell-fish by man is an instance of an eruption following the consumption of certain kinds of food. Medicinal agents are responsible for a large number of disorders of the skin, of the erythematous, papular, vesicular, and bullous type, all of which are known as drug eruptions. The occurrence of these diseases in the skin of the lower animals from the use of different drugs has not been recognized by veterinary writers, but there is no reason to doubt that they may occur from the continued employment for medicinal purposes of bromides, iodides, mercury, arsenic, salicylic acid, and other agents. Salicylic acid certainly has a marked local effect when given in considerable doses to cattle for the removal of large pendulous warts; after the use of the agent for this purpose for some weeks, the skin near the warts becomes inflamed, and the warts fall off in succession, leaving the raw surface, which rapidly heals. The use of the agent is then, of course, discontinued.

The fact of the occurrence of eruptions of different kinds from the action of external and internal agents should, under all circumstances, be taken into account in forming a diagnosis.

LOCAL INFLAMMATIONS

A considerable number of the most common affections of the skin of the horse, among them erythema, urticaria, eczema, ecthyma, &c., come under the head of local inflammations.

Erythema is the term applied to any redness of the skin, whether or not it is associated with an eruption. In its simple form erythema consists of patches of redness, which may be caused by friction, stimulating applications, and, in short, by any irritating substance which will bring about congestion or undue fulness of the vessels.

Erythema intertrigo is the name given to the redness produced by friction between two surfaces of the skin, as sometimes occurs between the arm and the brisket—that part which is called the axilla; it occurs also in the groin, especially of fat animals.

A very characteristic form of erythema in the horse is familiarly known as "mud fever", on account of the disease occurring in wet seasons, when the ground is soft and sloppy. It is a common ailment among hunters, especially when cold winds prevail, and the legs and body become splashed with mud and made repeatedly wet and dry in the course of a hard day's hunting. It is somewhat curious that in particular districts the irritation caused by the mud is most marked, and certain parts of the country are credited with having soil contaminated with some irritating matter, which, however, cannot be discovered by most careful examination.

The disease is manifested by irritation, soreness, and tumefaction of the skin, generally accompanied by a certain degree of fever, swelling of the legs sometimes incapacitating the animal for several days. It now and again occurs that the hair falls off in patches, but the blemish thus caused is not as a rule permanent.

A similar disease of the skin is also recognized among hacks and working horses under certain circumstances, irrespective of locality. Animals used for any purposes during muddy weather, and particularly when the nature of their work renders it necessary that they should be constantly in use, often suffer severely. The disease is commonly most marked in the winter-time when snow is on the ground, and more particularly when a sudden thaw takes place and cold easterly and north-easterly winds prevail. In this connection it has been noticed that in certain establishments, where the pressure of work or the shortness of hands occasioned neglect of grooming, the animals which on coming in from their work were turned into their stalls without having the mud washed from the legs and body escaped the mud fever altogether, while those which were carefully groomed and had the mud thoroughly washed from their skins were invariably attacked. As a matter of course, this fact came under the observation of veterinary surgeons, who were, from the nature of their avocation, in the best possible position to test the truth of the presumption that washing the mud from the legs and body of the horses was a cause of mud fever. It took a long time to reconcile

horse-owners to this apparently unreasonable view, but it is now perfectly well known that in establishments where washing has been discontinued mud fever and cracked heels are of rare occurrence.

In the human subject erythema exhibits itself in a great number of forms, according to the situation of the disease and the character of the cause which produces it.

Erythema intertrigo is one of the forms which occur in the horse when two surfaces of skin rub against each other, and the term may conveniently be extended to include all those instances of redness following friction from any part of the harness, saddle, or collar. It will be noticed, however, that the irritation induced by friction is not likely to be detected in dark-coloured animals, and the cause therefore is frequently allowed to continue until abrasions occur, and the so-called "shoulder galls" appear. These conditions are common enough among working horses wearing a badly-fitting collar, and are difficult to deal with on account of the impossibility of the healing process taking place so long as the use of the collar is continued. The device which is resorted to, of hollowing out a part of the collar which causes the abrasion, is only partially successful. In order to dry up the abraded surface and harden the skin, an astringent lotion is usually employed; a solution of chloride of zinc, or bichloride of mercury, is generally effectual. A very convenient lotion to be kept in the stables is made by mixing Sir William Burnett's disinfecting fluid, in the proportion of one part to fifty of water, the bottle, of course, being marked with a *poison* label.

Purpura is a form of erythema which occurs in the horse under the name of purpura hæmorrhagica. This disease consists in extravasation of blood into the tissues of the true skin, either from dilatation and over-distension of the vessels from deranged nerve-function, or from a morbid condition of the blood itself. It can hardly be looked upon as a distinct disease of the skin, but rather as an indication of some serious pathological state of the system, which would generally be classed under the heading of blood diseases. So far as the skin itself is concerned, the disease is exhibited in the form of patchy elevations, associated with blood-spots on the visible mucous membranes. The affection appears to be peculiar to the horse, and is met with at the termination of debilitating diseases, such as influenza and strangles. (See Purpura Hæmorrhagica.)

Urticaria—commonly described as nettle-rash—frequently occurs in the horse during the spring and summer months. The causes are a sudden change of diet, especially from hard corn to fresh succulent herbage, such as grass, clover, rye-grass, vetches, &c., drinking cold water when the

animal is heated, or the sudden movement of an animal from a hot stable to a cold, wet atmosphere. The form of urticaria which arises from dietetic errors is distinguished as *urticaria ad ingestis*.

The eruption in this affection occurs very suddenly in the form of flattened, more or less rounded elevations, differing much in size, the majority of them being something from an inch to two inches in diameter. They commonly occur on the neck, and frequently over a considerable part of the body, and sometimes the head also. The lumps appear very quickly, and may be so closely packed as to run together into a single patch the size of a dinner-plate. Sometimes when the eruption is scattered, and the lumps are not much larger than a shilling, the disease assumes a chronic form, and is attended with loss of hair from the raised patches. It is curious that the new hair is always lighter in colour than the rest of the coat. The treatment of the disease consists in the administration of a mild laxative, to be followed by small repeated doses of bicarbonate of soda and chloride of sodium in the food night and morning.

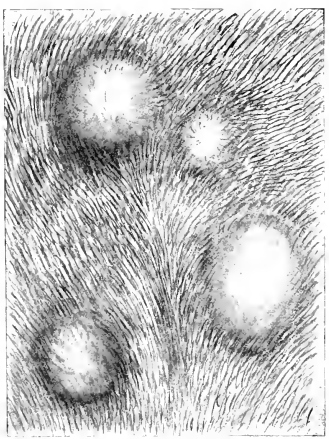


Fig. 265.—Urticaria

Liquor arsenicalis, in doses of an ounce to an ounce and a half, given in the food night and morning, may also be tried where the disease proves obstinate, and failing with this, some vegetable tonic, as gentian and columba root, or quinine, deserve a trial.

If there is much irritation, a little Goulard water may be applied to the seat of eruption, or a liniment of glycerine and oxide of zinc.

CATARRHAL INFLAMMATION

Eczema is the most common disease occurring in the horse, typical of the catarrhal condition of the skin. It consists, in the first instance, of inflammation of the superficial layers of the true skin, with an eruption

of small papules, or vesicles, which sooner or later break and discharge a watery fluid of a somewhat adhesive character, as shown by the gluing of the hair in tufts. Later, small scabs or crusts appear at the seat of eruption, and are frequently rubbed off by the animal trying to relieve the itching, leaving raw surfaces beneath.

Eczema presents itself under several forms. When the attack is mild,

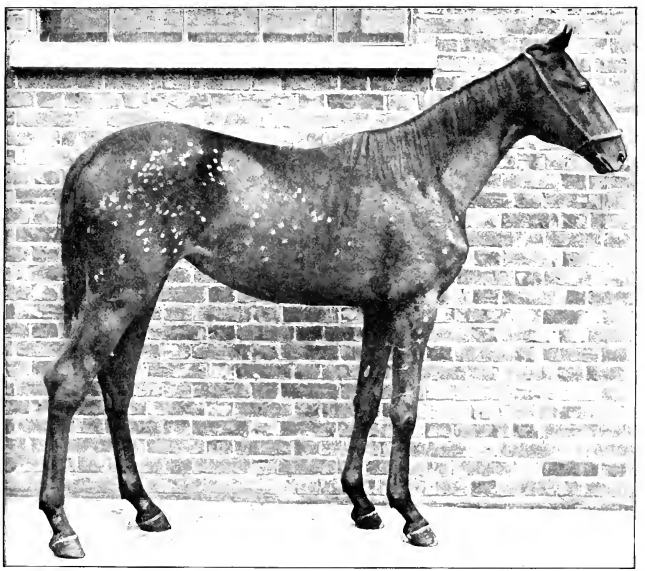


Fig. 266.—Eczema

without any symptoms of constitutional derangement, the disease is termed *eczema simplex*. In more severe attacks, when the inflammation of the skin is more pronounced and the surface is swollen and tinged with red, the term *eczema rubrum* is used. In the most severe form of the disease the eruption becomes pustular, when the small vesicles are filled with "matter" instead of watery fluid. A fourth form of the disease is characterized by the cuticle of the skin being thrown off from the affected

part in bran-like scales. This is described as *squamous eczema*, and has a great tendency to become chronic. Eczema may occur in different parts of the body, but it is perhaps most common in the upper part of the neck and over the quarters. The symptoms of the disease, from first to last, vary according to the stage. Congestion is observable at the commencement, indicated in light-skinned animals by a redness of the surface (*erythema*). This is followed by an eruption of pimples, next vesicles or blisters form and break, and discharge their contents. Should the inflammation be acute, the discharge becomes purulent. From the first there is some irritation and itching, which may induce the animal to rub or bite the diseased parts within reach. Eczema may be distinguished from other skin affections, for being a distinctly catarrhal disorder it is always associated with a discharge of a more or less sticky fluid, and is therefore described as a "moist disease".

Treatment must be adapted to the stage of the disorder. In the simple forms, soothing treatment is recommended; as the disease advances to the pustular stage, tonics and astringents are prescribed, and in the last stage stimulants are advocated. In the simple form, an alkaline lotion with a little glycerine and a small quantity of tincture of opium will relieve the irritation; or in place of the lotion, flour may be sprinkled over the moist parts. In the final stage, when crusts are being formed, a ten-per-cent solution of carbolic acid may be employed, and when the surface becomes dry and covered with scurf, the ointment of the oxide of zinc will be beneficial. Throughout the disease saline laxatives may be administered when necessary, and in the latter stages tonics, such as mineral acids and iron, and in some cases arsenic, will be indicated. Arsenic is most conveniently administered in the form of Fowler's solution, in doses of one ounce to an ounce and a half, which may be sprinkled on the food night and morning, or mixed with the drinking water.

PLASTIC INFLAMMATIONS

The diseases included under this heading are lichen and prurigo.

Lichen is a papular disease, which is described by Williams as the papular form of eczema. It commences by an eruption of small papules, from which a fluid is discharged, and afterwards becomes dry and forms a crust. The disease is most frequently seen on the legs of horses, along the course of the flexor tendons. The exudation which occurs round the hair follicle glues the hairs together, forming small tufts, and gives to the legs the appearance of being covered with tails of rats; in fact, the disease is commonly called "rat tails".

Treatment would be precisely the same as that prescribed for the pustular form of eczema.

Prurigo.—This disease is distinguished by an eruption of slightly raised papules, which in the case of a horse can be felt more easily than seen. Considerable itching attends the eruption, and as a result of the scratching or biting the irritation rapidly increases; the tops of some of the pimples are frequently rubbed off, and a blood-coloured scab is formed. In severe attacks the disease is complicated with the secondary consequences produced by scratching. It is sometimes difficult to distinguish between prurigo and some stages of eczema. Prurigo generally arises from debility, due to insufficient food, hard work, and absence of proper sanitary precautions. It may be looked upon as one of the consequences of bad stable management.

The treatment consequently will consist chiefly in liberal feeding, while at the same time the bowels should be carefully regulated in their action by the occasional administration of a dose of laxative medicine, of which sulphate of magnesia is perhaps the most to be preferred. Vegetable and iron tonics, or both combined, may be necessary where great debility exists. Some cases yield more readily to a run at grass and a course of alterative medicine. As external applications, a lotion of vinegar and water, or glycerine with a solution of the acetate of lead, will be found to allay the irritation.

BULLOUS INFLAMMATION

Herpes is the only disease which comes under this heading, so far as the horse is concerned. It consists of the eruption of vesicles in patches of an irregular form; the vesicles are sometimes very large, and are called blebs or bullæ. The lips in the horse are sometimes the seat of the disease, and it also appears round the coronets; the mucous membrane of the mouth is also sometimes invaded. A characteristic variety of the disease is *herpes circinatus*, in which the eruption of vesicles appears on various parts of the body. In this form the disease is commonly described as ringworm; it is, however, quite distinct from the true contagious ringworm, which depends on the presence of a parasitic plant. In herpetic ringworm the vesicles appear in a ring surrounding a patch of healthy skin, whereas in parasitic ringworm the disease commences in the centre and spreads outwards. Herpes depends as a rule upon some derangement of the digestive organs, and ceases when the normal condition is restored. Very little treatment is necessary. The local irritation can be removed by the application of a lotion composed of a solution of the

acetate of lead and glycerine, and any existing derangement of the system may be met by judicious dieting, and the administration of alterative medicine, as a mixture of equal parts of sulphur, nitrate of potash, and resin, which may be mixed with the food and given morning and evening.

SUPPURATIVE INFLAMMATIONS

Diseases occurring in this class are limited to those in which pustules constitute the primary lesion. In the lower animal the affection which is known as *ecthyma* is the only disorder which may be considered a typical one. *Furunculus*, which means merely a boil, is of occasional occurrence in horses, and would naturally come under the same class.

Ecthyma commonly appears in the form of pustules of various sizes on an elevated patch of skin, which is extremely tender to the touch.

It may be simple or contagious; the latter form of the disease is the more prevalent, and is better known in this country as the "American Horse-pox" or the "American Horse Disease", and by some as "German Boil". These terms had no doubt their origin in its common occurrence among imported horses, especially those from America, Canada, and Germany. It is essentially a local disease, which spreads from animal to animal more especially by means of infected clothing and harness; it appears to be necessary that the contact of the skin with the contaminated article must be extremely close. The mere throwing of a soiled cloth over an animal's body is not alone sufficient to transmit the disease; but if it be ridden for a short distance while the infected cloth or saddle is on the back, the disease is almost certain to follow.

The appearance of the malady so often on the withers, the lay of the collar, and the back, is probably to be explained by the favourable influence which the heat and moisture generated in these parts exercise on the propagation of the contagion.

Treatment.—This being a local disease will depend mainly on local applications for its eradication. To commence with, it is desirable that all contaminated clothing should be removed and the employment of contaminated harness be discontinued. A ten-per-cent solution of carbolic acid should be freely applied on and around the pustules twice a day, not only to bring about speedy healing of the sores, but at the same time to destroy the contagion existing in the discharges. A little boracic acid and flour dusted over the wounds two or three times a day may be used with the same object.

In severe cases the food ration should be diminished, and the state of the bowels may require the administration of a mild aperient.

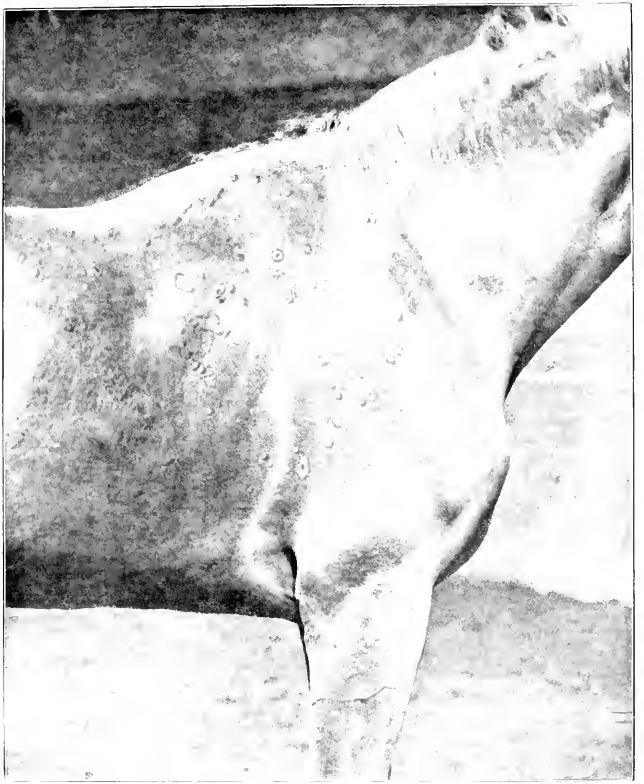


Fig. 267.—Contagious Ecthyma, or American Boil

To guard against its further spread, all soiled clothing, harness, brushes, cloths, sponges, and stable utensils should be thoroughly cleansed and disinfected, and the same should be done with regard to the stall-posts, partitions, and fittings of the box or stall occupied by the diseased horse.

SQUAMOUS INFLAMMATIONS

Pityriasis and psoriasis are the two affections which come properly in this class.

Pityriasis, as the name implies, is a disease of the skin in which the surface becomes covered with white scales having the appearance of bran. It is usually associated with poverty, and disappears as the general condition improves. Horses suffer from the disease occasionally, but not so frequently as cattle.

Treatment.—According to Williams, the disease in the horse is associated with presence of oxalates in the urine, and he accordingly advises that carrots and turnips and all kinds of food which furnish sugar should be withheld. We would, however, suggest a liberal allowance of green food when such can be obtained, and a generous but well-regulated corn ration. The chief object to be obtained is to improve the nutritive function of the skin. For this purpose a powder consisting of equal parts of sulphur, resin, and nitrate of potash should be given twice daily, and a dose of solution of arsenic with the mid-day feed. The patient should not be allowed to lead a sedentary life, but be freely exercised every day.

Psoriasis.—The characteristic features of this disease are the accumulation of scales in raised patches and thickening of the underlying skin. In the horse psoriasis mostly prevails in the heavier breeds, and especially among animals fed up for exhibition. It is chiefly limited to the neck close to the mane, the inner aspects of the ears, and over the tail. The affection commences in circumscribed spots, which gradually extend and unite to form large scaly patches. In the bends of the joints it is generally the case that cracks appear in the skin from which discharge issues, and from the constant movement in the part the fissures do not readily heal, and the irritation which exists sometimes causes general stiffness of the limb and lameness.

The treatment to be employed is chiefly local. Carbolized oil, or zinc ointment, or in some cases iodine ointment, according to the stage of the disease, may be employed; but it is well recognized that, although the affection may be subdued and kept under for a time, it is extremely difficult to cure. Overfeeding, want of exercise, and dirty stables are common causes of its recurrence when once subdued.

ICHTHYOSIS

This disease is characterized by more or less hypertrophy of the skin as a whole, but especially by the free and morbid outgrowth and accumulation of epidermis upon it.

In man it is congenital and hereditary, and it may be so in the horse,

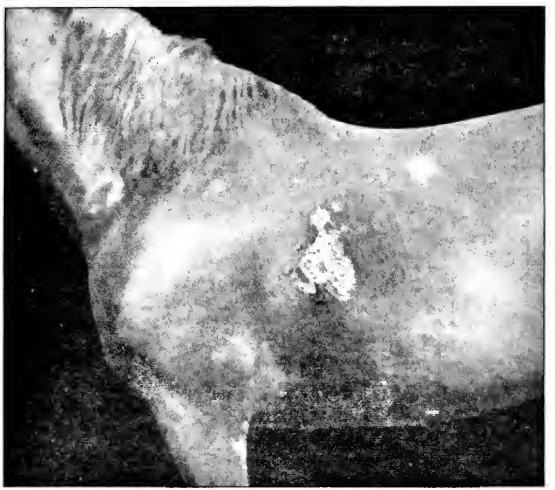


Fig. 268.—Ichthyosis

but the seldom occurrence of the disease in this animal has not afforded an opportunity of our forming a definite opinion on this point.

In the ox it is more common, but inasmuch as it seldom calls for treatment its congenital and hereditary nature still remains a matter to be determined.

Ichthyosis is intimately related to a dry and scaly condition of the skin termed Xeroderma, and between the two affections there does not appear to be any well-marked line of demarcation. When, however, the epithelial collections are considerable, and accumulated into well-defined scales or flakes, the disease is termed Ichthyosis. It would appear, therefore, that xeroderma and ichthyosis represent degrees of the same disease,

distinguished from each other by the larger and more compact or flaky condition of the epidermis which is formed in the latter.

Symptoms.—Generally the skin is harsh, dry, thickened, wrinkled, and dirty, and the hair about the diseased parts stares. Patches are seen here and there consisting of superimposed layers of epidermis, which may be removed in thick flakes or hard, compact, horny layers. Sometimes the epithelial growth assumes the form of a more or less cylindrical outgrowth or horny excrescence which requires to be cut off. Some of these epithelial developments are black and dirty, while others wear a white shiny appearance not unlike mica.

In the early period of formation they are covered with a bran-like epithelium which desquamates, but later develops into dense flaky patches.

Ichthyosis is a purely local disease, confined to the skin, and so long as it does not appear on parts to which the harness is applied the patient may suffer but little inconvenience from it.

It cannot, however, be cured, and when, as sometimes occurs, it seriously attacks these parts, the chafing of the collar or saddle altogether incapacitates the animal from work.

Where it accumulates in large heaps it may be removed by hot water in which a little soda is dissolved, after which the skin round about it may be massaged and the affected part smeared with vaseline.

HYPERTROPHIES AND ATROPHIES

HYPERTROPHIES

Verrucæ.—Verrucæ or Warts are of very common occurrence, and consist in a local enlargement or overgrowth of all the constituents of the skin. The horse is particularly liable to them; they appear in different positions, and frequently in parts which come in contact with the harness; but they are of still more frequent occurrence in parts of the skin which are absolutely free from all risk of pressure or friction, and this fact suggests that neither of these causes can have much to do with their production. On the eyelids, about the lips, on the inferior parts of the abdomen and the sheath, warts are common, and these parts are free from contact with the harness or pressure of any kind. Warts are of different forms, sometimes being diffused and scarcely raised above the surface, involving large portions of the skin. Another form is the ordinary pedunculated wart, which hangs from a pedicle or narrow neck; and there is also a lobulated form which projects from the skin and generally presents a red and sometimes bleeding surface.

Treatment of warts is essentially of a surgical character; the means adopted for their removal are various. The most summary method of removing them is by the use of the knife; a ligature in the case of pedunculated warts is also employed, and caustics are used for warts in any shape or in any position. A favourite compound is arsenic mixed into a paste with honey. The wart which is to be removed is scraped in the centre until slight bleeding occurs; to this spot the arsenical paste is applied, and the inflammation which follows ends in the sloughing of the whole growth; but unless the caustic preparation is employed very carefully, the destructive action of the arsenic will extend beyond the wart and serious loss of structure is likely to happen. When warts occur in positions where caustics could not safely be used, it is the practice of some to take the affected animal to a slaughter-house and dress the warts with the blood of a recently-killed animal. Two or three applications of this treatment are said to cause the growths to shrink and ultimately to fall off.

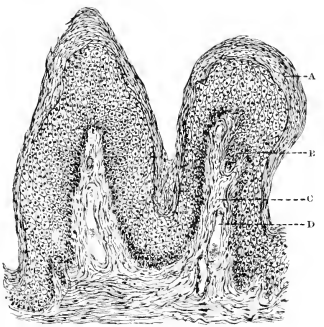


Fig. 269.—Section of Wart

A, Horny Epidermis. B, Deep Layer of Germinal Cells. C, Fibrous Stroma. D, Blood-vessel.

Fibroma.—Fibro-cellular growths in the skin are of occasional occurrence in the horse; they are sometimes described as soft warts. The presence of the cellular element in the tumour renders their permanent removal doubtful. They are got rid of for the moment by the use of the knife, but the growth is likely to recur, and in order to arrest this as far as possible it is desirable to employ caustic dressing immediately after the operation.

ATROPHIES

Any form of senile decay would be reckoned amongst atrophies, but the condition is rarely observed in the horse excepting as the result of continuous pressure on a particular part. The hair appears to suffer from this change more than other of the cutaneous structures.

NEW FORMATIONS

Of the diseases included in this group, *i.e.* cancer, lupus, and rodent ulcer, the first is the only one which is recognized in the horse. The disease in that animal is of rare occurrence, and usually affects the internal organs. It can scarcely be referred to, therefore, as a skin disease.

HEMORRHAGES

Extravasation of blood into the superficial layer of the true skin is described as purpura. The hemorrhage occurs as a consequence of some change in the composition of the blood, excessive pressure of blood in the small vessels, or impairment of the functions of the nerves which regulate their calibre. The lesions or blood-stains in the skin may be in the form of spots, small or diffused patches, or marks which look like bruises. The discoloration, it should be noticed, is the result of diffused blood and not merely of congestion. Pressure applied to the latter completely removes it, but it does not remove the discoloration by blood when extravasated. As the cause of the extravasation is some serious derangement of the system, the disease is not to be dealt with by local remedies. (See Purpura Hæmorrhagica.)

NEUROSES

The diseases which are included in this division are increased sensibility, diminished sensibility, and perverted sensibility. The last of these is known in the horse as pruritus, which is really, as the word indicates, itching without any recognizable cause; there is no detectable eruption nor any redness save what may result from the part being scratched, in fact itching is the only symptom which has to be dealt with by remedies. In many cases the itching is so excessive that in the language of the groom the horse is driven nearly mad, and in his excitement he tears his clothing, and increases the irritation by rubbing or scratching, causing an eruption and erosions in various parts of the body.

The treatment of the disease, which is necessarily associated with general systematic derangement, belongs more properly to the domain of general medicine, but for the alleviation of the annoying irritation local remedies are indispensable. Dr. James Law of the Cornell University recommends a wash of water slightly soured with oil of vitriol, and rendered sweet by carbolic acid. If this acid lotion fails to afford relief, an alkaline and sedative mixture may be employed instead—for example, 2 drachms of carbonate of potash and 2 grains of cyanide of potassium in 1 quart of water. It

Fig. 270.—Sallanders

Fig. 271.—Mallenders

is of the first importance that the diet be carefully regulated and the work be duly adjusted to it. Excess of highly stimulating food must be guarded against. A liberal allowance of carrots and moist bran will prove useful in maintaining a free and regular action of the bowels. Where constipation exists a dose of physic may be required, and should the disease prove obstinate an ounce of Fowler's solution of arsenic must be administered morning and evening in the food.

MALLENDERS AND SALLANDERS

Eczema in a local form is seen in that condition of the legs known to stablemen as mallenders and sallanders. Here the disease is confined to the flexures or "bends" of the knees and hocks respectively. In the

former position it is termed "mallenders", in the latter "sallanders". (Figs. 270, 271.) With rare exceptions this form of the disease is confined to the heavy breeds of horses, and especially to those with fleshy legs, a thick skin, and a profusion of coarse hair. It is essentially hereditary in its nature, and appears to be brought into existence by the excessive use of highly nitrogenous diet, particularly the indiscriminate use of beans. Not unfrequently it is preceded by swelling of the legs following upon a brief respite from work.

Sallanders sometimes ensues upon an attack of acute lymphangitis or mud fever, and is frequently found to be associated with chronic enlargement of the limbs.

HEMOPHILIA, HEMORRHAGIC DIATHESIS, BLEEDERS

By these terms is understood a disposition to bleed on the slightest provocation. In animals so constituted very slight injuries, which in others would prove perfectly harmless, are attended with profuse hemorrhage, and in some instances which have come under the notice of the writer, blood has dripped from the skin at numerous points without any obvious cause. In such subjects bleeding from wounds, whether the result of accident or surgical operation, becomes difficult to arrest, and may even proceed to exhaustion or fatal syncope.

In the human subject it is recognized as a congenital disease, and in some cases the predisposition to this form of hemorrhage has been known to be transmitted from parent to progeny, and this hereditary influence is recognized as the chief factor in the origin of the affection. Men are said to suffer from the disease much more than women, the estimated proportion being eleven of the former to one of the latter.

Its prevalence in the horse is not considerable, but the tendency to spontaneous bleeding from the nostrils is well known to exist in certain families of race-horses, and from time to time this weakness has been the cause of bitter disappointment to trainers and owners of thoroughbred stock. In one celebrated family, well known to all who are interested in the turf, it has exhibited a decided hereditary character, and proved a serious drawback to certain of its members.

Symptoms.—Animals which suffer from hæmophilia do not exhibit any obvious signs of constitutional disease. They invariably carry abundance of flesh, are sleek in their coats, and present all the indications of good general health. The most common form which the ailment presents in horses is bleeding from the nose, the mucous membrane of which becomes studded with blood-spots more or less numerous, and so closely packed

together in some instances as to form considerable patches. Sometimes the amount of blood actually discharged is slight, at others it is very considerable. The breakage of the vessels and leakage may also attack the lungs, when it is attended with a convulsive cough and marked distress in breathing.

Injuries in the form of contusions usually result in swelling out of all proportion to the violence inflicted, the enlargement thus occasioned being produced by the escape of blood into the tissues of the part.

As a skin affection it shows itself by the presence of numerous small points, from which blood or blood-stained serosity oozes from the surface of the integument, and hangs from the ends of the hairs in small red or reddish-yellow drops.

The diagnosis of the disease is affirmed when the bleeding, whether in one form or the other, is repeated from time to time, in which case it may give rise to anæmia, loss of condition, and general debility.

Treatment.—Animals affected with this disease should not be subjected to severe exertion, and should be protected against all forms of injury. Where operations require to be performed, it must be understood that they can only be carried out at the risk of inducing dangerous, if not fatal, hemorrhage. Operations should therefore be avoided if possible. In bleeding from the skin and mucous membrane, small repeated doses of perchloride of iron, alone or in combination with turpentine, may be given whenever the hemorrhage appears. The patient should be kept perfectly quiet, and confined in a cool well-ventilated box. The cessation of bleeding should be followed by the administration of small repeated doses of nux vomica and quinine, which may be given in the food.

Whenever a tendency to this disease is known to exist, the general health should be upheld by a liberal allowance of good food, regular and moderate work, and strict regard to the sanitary condition of the stable and other surroundings.

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13. PARASITIC DISEASES OF THE HORSE

INTRODUCTORY

Parasites, in the common acceptation of the term, are presumed to be worms of some kind which infest the internal organs of the higher animals. In reality the word has a much more extensive meaning, as it applies literally to all kinds of organisms which live upon other and higher organisms, and it is quite within the limits of possibility that science may

yet be able to demonstrate that every form of disease depends on the existence of a parasite.

At the present time it is known that certain diseases—for example, glanders, tuberculosis, and numerous others—are due to the presence of minute organisms only to be recognized under the higher powers of the microscope. A considerable number of diseases occupy a doubtful position in this respect, and a much larger proportion have not yet been suspected to be consequent on the presence of microbes, but additions are constantly being made to the number of microbe affections.

Parasitism, therefore, in its general sense, applies to a much larger number of disorders than are usually included in that definition. This section, however, will be exclusively concerned with those diseases which are connected with the presence of parasites which are not microbes.

It will be an advantage in the beginning to dispose of certain terms which will of necessity be used frequently in the following pages.

Parasites belong both to the animal and vegetable kingdoms, and they infest higher organisms of both kingdoms interchangeably, *i.e.* a parasitic plant may invade an animal as a parasitic animal may invade a plant, and the "host", as the invaded animal or plant is called, may harbour both kinds at the same time.

Parasites form only one division of the lower organisms which infest higher organisms. The general term which indicates the condition of which parasitism is a part is *Symbiosis*, meaning merely *association*. Thus some organisms live upon higher organisms to the advantage of both, and this form of symbiosis is described as *mutualism*. In another division the lower organism attaches itself to a higher one for the purpose of feeding on the remains of the food which the higher animal scatters around; this kind of association is distinguished as *commensalism*. It is obvious that the higher organism gains no benefit from this connection, but at the same time it suffers no harm.

In a third example of symbiosis, or the association of lower with higher organisms, the latter is injured more or less by the invasion of the former, which in the exercise of its functions robs its host of a certain amount of nutriment, and during the process of appropriation frequently excretes poisonous substances which are destructive to the tissues of the infested animal or plant. This is true *Parasitism*.

Certain terms are used to define the position of the parasites in or on the body of the host. For example, the terms ecto-parasites or epi-parasites include all the organisms which locate themselves on the surface; ento- or endo-parasites include all organisms which invade the interior of the body.

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It is with this end in view that THE NATURAL HISTORY OF ANIMALS has been compiled. It treats this great subject on essentially modern lines, giving an accurate and vivid account of the habits, relationships, mutual interdependence, adaptation to environment, &c., of the living animals of the world.

It is needless to say that the production of such a work demanded a man who has devoted his life to the study of biology and zoology, and who at the same time is a gifted writer and expounder. This rare combination has been found in the person of Prof. J. R. AINSWORTH DAVIS, M.A., of Trinity College, Cambridge, and of University College, Aberystwyth, the author of the present work. Prof. DAVIS is well known to naturalists as an ardent worker in Natural History, particularly in the field of marine zoology. He is a very distinguished graduate of Trinity College, Cambridge, the chief scientific school in Britain, perhaps in the world, and has done a great deal of literary work, both scientific and in other directions.

Briefly, **the object of Prof. Davis's work** is to give in a readable form and in non-technical language a general survey of the whole animal world from the stand-point of modern science—and the work may fairly claim to be a **Natural History on a new plan**, the first comprehensive work in English of its own special kind. Formerly Natural History had much the character of a miscellaneous aggregate of disconnected facts, but hardly any fact or feature connected with any animal can now be considered as isolated from others; and animals as a whole must be looked upon as interrelated in the most surprising manner both with one another and with their surroundings.

Every household library should contain a Bible, a Dictionary, an Encyclopedia, and a work on Natural History. This is the "irreducible minimum"; other books we may have, these we must. For THE NATURAL HISTORY OF ANIMALS it may fairly be claimed that it has a better title than any other work to become the **Natural History for the Household**. It is a work in which the adult reader will find a never-failing mine of information, while the younger members of the family will delight in its wealth of illustration, and its store of interesting and suggestive anecdote.

To teachers THE NATURAL HISTORY OF ANIMALS may be regarded as indispensable. More than usual attention has of late been directed to the important subject of **Nature-study**, and in this respect the appearance of Prof. Davis's work could scarcely have been more fitly timed. In the domain of Natural History it is pre-eminently the book for the purpose. Its clear and orderly arrangement of facts, its masterly grasp of general principles, its comprehensiveness of scope and simplicity of style, combined with the most absolute scientific accuracy, render this work an invaluable book of reference for those who aspire to teach Nature-study on up-to-date principles.

The Illustrations, as befits a work of such importance, are on the most lavish scale. A large number are in colour, reproductions, by the latest processes of colour engraving, of exquisite pictures by the most eminent animal draughtsmen. In illustrating the work talent has been sought wherever it was to be found; and the list of artists is representative of several nationalities. A large number of the designs are the work of MR. A. FAIRFAX MUCKLEY, who is probably unsurpassed in the capacity to depict living creatures with absolute fidelity to detail without sacrificing the general artistic effect. FRIEDRICH SPECHT, one of the most eminent German animal painters of the past century, is represented in THE NATURAL HISTORY OF ANIMALS by many of his best designs in colour and black-and-white. W. KUHNERT, another German artist whose work is universally admired; and M. A. KOEKKOEK, the talented Dutch painter, are also among those who have assisted in the embellishment of the work. An important feature is the series of diagrammatic designs showing the structure of certain typical animals, specially drawn under the direction of Prof. Davis.

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The Modern Carpenter, Joiner, and Cabinet-Maker:

A Complete Guide to Current Practice. Prepared under the editorship of G. LISTER SUTCLIFFE, Architect, Associate of the Royal Institute of British Architects, Member of the Sanitary Institute, editor and joint-author of "Modern House-Construction", author of "Concrete: Its Nature and Uses", &c. With contributions from many specialists. Illustrated by a series of about 100 separately-printed plates and 1000 figures in the text. In 8 divisional volumes, super-royal quarto, handsomely bound in cloth, with cover design by Mr. TALWIN MORRIS; also in 2 volumes, Roxburgh binding. In complete sets only.

In preparing THE MODERN CARPENTER the editor has had the great advantage of working upon the basis of Newlands's *Carpenter and Joiner's Assistant*, which for nearly half a century has been accepted as a **standard authority** on the subjects of which it treats, and for many years has been recommended by the Royal Institute of British Architects as a **text-book** for the examination of that society. And yet in the present work it has been possible to preserve only a very small part of Newlands's treatise, invaluable though this has been to two generations of craftsmen. While the fundamental features of arrangement and method which distinguish this famous work have been retained, the matter has had to be **entirely rewritten**, and many new sections have been added, on subjects not touched upon in the older work, with which the carpenter of the present day requires to be familiar.

In the new book, indeed, the old foundations that have stood the test of half a century of practical use have been retained, but **the superstructure is wholly new.**

The lesson to be learned from this fact is not far to seek. It is that the modern carpenter requires a **far wider expert knowledge** than sufficed his predecessor. The development of wood-working machinery, the introduction of new kinds of timber, improvements in the design of structures, the more thorough testing of timbers, and progress in the various industries with which Carpentry, Joinery, and Cabinet-making are intimately allied, have all helped to render the craft more complex. The carpenter of the present day has no use for the old "rule of thumb" methods; his calling is both an art and a science, and **knowledge, knowledge, and again knowledge** is the primary condition of success.

The editor of THE MODERN CARPENTER, **Mr. G. Lister Sutcliffe,** Associate of the Royal Institute of Architects, **needs no introduction** to practical men; his name is already well known not only through his professional position in the architectural world, but through his editorship of *Modern House-Construction*, a work which, although issued only a few years ago, has already become a standard book of reference. Mr. SUTCLIFFE'S large experience has enabled him to enlist the services of a **highly-qualified staff of experts,** whose special knowledge, acquired through long years of practical work, is now placed at the disposal of every member of the craft. The first condition in selecting the contributors to the work was that they should be **practical men,** not only possessing the indispensable knowledge, but having the ability to impart it. The result is that within the eight divisional-volumes of this work we have a treatise on every branch of the craft, distinguished by four outstanding qualities:—It is (1) **complete,** (2) **clear,** (3) **practical,** and (4) **up-to-date.**

An idea of the scope of THE MODERN CARPENTER may be gathered from the fact that while its predecessor, *The Carpenter and Joiner's Assistant*, comprised only **eight** sections, the new work includes no fewer than **sixteen.** A glance at these will show that the work **covers the whole field**; it is a complete encyclopædia upon every subject that bears upon the everyday work of the practical man.

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